QL
671
.W75

Vol. 55 JUNE, 1943 No. 2

The Wilson Bulletin

Published by the

Wilson Ornithological Club

Ann Arbor, Michigan

CONTENTS

Wood Thrush	Thomas S. Roberts	Pl. 2
A Nesting Study of the Wood Thrush	Hervey Brackbill	73
Territoriality, Display, and Certain Ecological Relations of the American Woodcock	Frank A. Pitelka	88
Nidification of the Passerine Birds of Hispaniola	James Bond	115
General Notes		127
Editorial		133
Wildlife Conservation		134
Ornithological Literature		87, 125, 136–142
Reports		143

THE WILSON BULLETIN

is published quarterly in March, June, September, and December, as the official organ of the Wilson Ornithological Club, at Ann Arbor, Michigan, and is sent to all members not in arrears for dues. The subscription price is $2.00 a year, invariably in advance, in the United States. Single numbers, 50 cents. Outside of the United States the rate is $2.25. Single numbers, 60 cents. Subscriptions should be sent to the Treasurer.

All articles and communications for publication, books and publications for review, exchanges, and claims for lost or undelivered copies of the magazine, should be addressed to the Editor.

The current issue of *The Wilson Bulletin* is printed by the Ann Arbor Press, Ann Arbor, Michigan.

Entered as second class matter July 13, 1916, at Ann Arbor, Michigan, under Act of Congress of March 3, 1879.

THE WILSON ORNITHOLOGICAL CLUB

Founded December 3, 1888. Named after Alexander Wilson, the first American ornithologist, and called the "Father of American Ornithology."

The officers for the current year are:

President—George Miksch Sutton, Cornell University, Ithaca, N.Y.

First Vice-President—S. Charles Kendeigh, University of Illinois, Champaign, Illinois.

Second Vice-President—Olin Sewall Pettingill, Jr., Carleton College, Northfield, Minnesota.

Treasurer—Milton B. Trautman, Stone Laboratory, Put-in-Bay, Ohio.

Secretary—Maurice Brooks, University of West Virginia, Morgantown, West Virginia.

Editor—Josselyn Van Tyne, University of Michigan, Ann Arbor, Mich.

Associate Editors—Margaret M. Nice and F. N. Hamerstrom, Jr.

Membership dues are: sustaining membership, $5.00; active membership, $3.00; associate membership, $2.00 per calendar year.

Minneapolis, 1903 *Photo by Thomas S. Roberts*

WOOD *THRUSH*

Museum
gr.
6-29-43

THE WILSON BULLETIN

A QUARTERLY MAGAZINE OF ORNITHOLOGY

Published by the Wilson Ornithological Club

Vol. 55 JUNE, 1943 No. 2

A NESTING STUDY OF THE WOOD THRUSH[1]

BY HERVEY BRACKBILL

IN Baltimore, in 1942, a color-banded pair of Wood Thrushes (*Hylocichla mustelina*) was watched for 75 hours during two nestings. All of the watching was done openly, from distances of 25 to 50 feet, the birds showing no hesitancy about their affairs.

Migration and Distribution

Arrival and departure. The male took up territory with loud song early on the morning of April 29, the first day on which Wood Thrushes were noted in his part of the city; he was color-banded the same morning. The female, a partial albino which it would have been impossible to overlook, was first noticed on the afternoon of May 2; she was then already in company of the male and was color-banded the same day. The male was last seen July 20 and the female July 26; the Wood Thrush, as a species, was present through September 16.

Habitat. Resler (1891:106) stated 50 years ago that at Baltimore the Wood Thrush "frequents shady woods, especially near the banks of a brook or small river" and "appears to be not so well known as the majority of our other songsters, in consequence of being more solitary and shy." Weaver (1939:16) likewise stresses dampness of woodland habitat at Ithaca, New York; notes that undergrowth and saplings also seem to be necessary; and mentions an "increasing tendency" to dwell about occupied houses "in the vicinity of gorges, streams, woods, or damp places."

Dugmore (1900:169), however, found "damp or dry places . . . indiscriminately chosen" for nesting in the neighborhood of New York City, and Cooke (1929:65) found the birds much less shy, reporting that in the region of Washington, D.C., "they now nest freely about lawns in the suburbs as well as in the woods." Chapman (1940:413) also places them on "well-shaded lawns."

My own observations of the last decade in Baltimore accord with those of the latter group of writers. Shrubbery or undergrowth does, however, appear to be essential—as cover for newly-fledged young.

[1] Grateful acknowledgment is made to Mrs. Margaret M. Nice for criticism during the preparation of this paper.

But I have not found the species restricted to the immediate vicinity of streams, nor have I found the woods which it inhabits to be more moist than others. In contrast to the nests mapped by Weaver (1939:17), of which the one farthest from water was only 150 feet away, the first nest of my thrushes was 800 feet from water (except for a bird bath), and other Wood Thrushes nested at even greater distances; song is common every summer in suburban neighborhoods 2,000 and 3,200 feet from water.

The habitat of my birds, 350 feet above sea level, was a block in northwest Baltimore that is lined on three sides by detached houses; on the fourth side a large vacant lot runs in deeply. That lot and most of the back yards bear a close stand of oaks—chiefly white oaks (*Quercus alba*)—70 feet tall, with also a huge elm, a smaller beech, and two or three mulberries. There are a few isolated trees between houses, and oaks in most of the front yards. The outer half of the vacant lot is heavily weed-grown, and practically all of the yards contain more or less shrubbery.

Nests

Nest sites. Despite the comparative wildness and privacy offered by the well-wooded heart of this block, the thrushes' nests were built in trees that stood between, and close beside, houses. The second nest was 90 yards north-northeast of the first.

The first nest was placed 17 feet up in a 50-foot beech (*Fagus grandifolia*); it was set upon the base of a horizontal fork 10 feet out from the trunk, and was 10 feet from the side of a house. The second nest was 13 feet up in a scraggly 16-foot tree of heaven (*Ailanthus altissima*); it was set amid four new shoots which rose steeply from the tip of an old stem, and was 6½ feet from the side of a house.

Building and laying. I saw none of the building or laying; incubation of three-egg clutches was under way in both nests when they were found.

Weaver (1939:16) suggests that the female chooses the nest site,[2] and reports a building time of 5 days. Dugmore (1900:169) gives the incubation period as 12 days. Using those figures, assuming that the eggs were laid on successive days and that incubation began after the laying of the second egg, and calculating back from the hatching dates of May 30 and 31, it appears that work on the first nest began about May 13, 11 days after the female's arrival in the territory.

Similar calculations indicate that the second nest was begun on the eighth day after the first brood was fledged, and that the first egg of the second set was laid on the thirteenth day. Weaver (1939:22)

[2] My color-banded male has returned in 1943, but he has a different mate: a normally plumaged bird, so far unbanded. Nevertheless, his nest is near completion only 6 inches from the site of his first-brood nest of 1942. This indicates strongly that the male selected this site. All of the building that I have seen, however, has been done by the female.

observed a fledging-to-egg interval of 16 days for one pair of Wood Thrushes at Ithaca.

Incubation

Amount. The eggs were incubated entirely by the female, who was on the nest for 78.0 per cent of the 940 minutes that first-brood incubation was watched and for 80.3 per cent of 1,014 minutes at the second nest. The bird's night term on the nest was about 9¼ hours. Thus the eggs were covered for approximately 87 per cent of the day's 24 hours.

Twenty-three complete sittings observed at both nests ranged in length from 7¼ to 58½ minutes; 11 at the first nest averaged 31 minutes, 12 at the second nest averaged 27. Forty-one intervals off both nests ranged from one to 16 minutes; 22 at the first nest averaged 8½ minutes, 19 at the second nest averaged 6⅒.

Among sittings not seen in their entirety were one unfinished at the end of 70 minutes on May 28, the second day before the hatching of the first brood began, and one unfinished at the end of 76 minutes on July 6, the day before the hatching of the second brood began. These suggest especially close sitting during the last days of incubation. During a 90 minute observation period on July 5, however, sittings were of only normal lengths.

During rain. The female was once watched at incubation in the scantily-leaved ailanthus during a terrific downpour for 18 minutes, followed by a drizzle for 10. Three times in the first four minutes she half rose and then resettled herself, apparently adjusting to the torrent. For the first 13 minutes she held her head up at a 60-degree angle from its normal horizontal position, possibly to compress the plumage of the nape and so shed more water. After that she sat normally.

During high wind. While incubating in the spindly ailanthus tree the female was also watched for 80 minutes during a period of strong puffy winds. The puffs now and then carried the nest, atop the slight and almost vertical stem, over an arc of from three to at least five feet; twice the nest was carried so far that it tilted downward at 45 degrees, and once it almost stood on edge.

The lesser puffs did not seem to inconvenience the bird; she even rose during two of them and stretched her wings and legs. But two of the three extreme swings appeared to throw her off balance: she stepped out to one of the supporting shoots while the tilt was greatest, and then back on again. She moved unhurriedly, and it seemed each time that the eggs must spill before she returned to the nest.

Male's activities during sittings. During the female's sittings on her first clutch the male usually occupied himself out in the territory, foraging, singing, preening, or just idling. Two trees on the edge of the oak grove, 75 and 85 feet north of the nest-beech, were favorite perching places, no doubt because they commanded a clear view of the beech

and so enabled him to see when the female left to feed. For it was usually only upon her departure that he went to the nest to stand guard. A few times, too, he kept his guard from these oaks.

Not infrequently, though, the male spent some time in the nest-tree itself while the female was on these first-brood eggs: periods that ranged from a few seconds to almost half of the sitting. During these periods he might preen a bit, or simply stand idle, but was only once observed to sing (for seven minutes of a nine-minute stay).

The male's activities during the female's second-brood sittings differed in two ways: he was still feeding the first-brood young during the first week of incubation and, even after he had become free of that task, he spent no time in the nest-tree with the female. Since he did once perch for five minutes on the roof-edge some yards above the second nest, it may be that this change in behavior was not only part of a general decrease in attentiveness during the second nesting but was due in some degree to the smallness of the ailanthus; in the beech he had usually perched 10 feet away from his mate, and no such distance was possible in the ailanthus.

His favorite perches during second-brood incubation were 50 feet north and 90 feet south of the nest; the first commanded a view of the nest, the second did not.

Male's activities between sittings. When the female left the first-brood nest to forage, the male almost invariably kept guard over it, usually from the rim of the nest or some perch in the home tree. Sometimes he sang during part of his watch—twice he sang half a dozen phrases while standing on the nest-rim, and another time sang for two minutes while standing just beside the nest. During only one of the female's 22 absences while this nest was under observation was the male neither seen nor heard.

At the second nest he stood guard during only 12 of the female's 19 observed absences. In doing so during 5 out of 8 while he still was feeding first-brood young he set a surprisingly good record; however, after becoming free of feeding duties he maintained only that reduced ratio, guarding during 7 of 11 absences, so that here, too, a decrease in attentiveness appears. Another difference in behavior was that he never sang while on guard in the second nest-tree, although he did sing a few times from other guard stations nearby.

Hatch. Of the first clutch, one egg hatched May 30 and the other two May 31. The second set of three hatched on three successive days, July 7 to 9. The hatching hour was determined for only one egg (the last one to hatch of the first set): 2 hours 17 minutes after sunrise, at 6:59 A.M. The female was sitting at the time, and she flew away southwesterly with half of the shell; three minutes later, while she was still away, the male alighted at the nest, made a feeding, and then carried the other half of the shell away northward.

Brooding

Amount. The female alone brooded the young. She did so on every day of their nest life, and also at night—whether throughout every night was not determined, but the persistence of her diurnal brooding makes that seem probable.

She covered her first family for 62.8 per cent of 641 minutes' observation, during which the temperature range was 61° to 85° F. and the skies varied from clear to misting. She covered her second family for 45.5 per cent of 610 minutes' observation; mere attendance, during hot weather, raised her total time at this nest to 72.7 per cent. The temperature range during these observations was 73° to 95°, the skies clear.

There was no progressive daily decrease in brooding at the first nest, nor any clear correlation between weather and amount of brooding. These statements also hold for the second nest, except at temperatures of 93° and above.

At 93° and above, both the female and the nestlings showed discomfort by holding their bills open more or less of the time, and the female did almost no actual brooding but simply stood for 46.5 to 85.0 per cent of the time on the nest's rim or on a branch beside the nest—*but, curiously enough, never on the sunward side, where she would have shaded the young.* On some days this behavior was continued beyond the period of extreme heat—until the temperature had fallen as low as 88°.

Feeding

Sharing of work. Both parents fed both broods of young both in and out of the nest, but the male fed them much more often than the female. He made two-thirds of the feedings while each brood was in the nest, and almost all the observed feedings after each brood left the nest.

Length of day. I observed when second-brood feedings started on one morning (at 4:27 A.M., 24 minutes before sunrise), and how late they lasted on one evening (until 7:42 P.M., 8 minutes after sunset), which would suggest a feeding day of 15¼ hours. Both observations were made in clear weather.

Rate. During 826 minutes that feedings were watched at the first-brood nest, 120 trips were made with food: 78 by the male, 40 by the female, and 2 by an undetermined parent. At least five times the male fed two nestlings on one visit, and at least three times the female took part of the food he brought and fed an extra nestling. Counting 128 feedings, then, the average interval was 6.4 minutes, and the rate of feedings was 9.3 per hour for the brood of three.

During 813 minutes of feedings at the second nest, 61 trips were made: 42 by the male, 16 by the female, 3 by an undetermined parent. The male at least twice and the female once fed two nestlings on one

visit. Counting 64 feedings, the average interval was 13 minutes for this brood of three, a rate of 4.7 feedings per hour—just half the rate for the first brood.

No steady increase in feedings from day to day was noted at either nest.

Despite the difference in their observed feeding rates, with no perceptible difference in the size of meals, the second brood left the territory when 10 to 12 days old, the same age at which the first brood left the nest—equivalent acts, since the first brood obviously could have been led away at once had not the second nest held the parents to the territory.

Male's feedings. Because the female brooded so much, she was usually on the nest when the male arrived with food. At the first nest the female generally stayed during the feedings, and it was not unusual for the male to make two or three trips during single sittings. At the second nest, on the other hand, the female almost always flew away as soon as the male arrived.

When the female left the first nest upon his arrival, the male sometimes kept guard until her return, as he had done when there were eggs, but he was never seen to keep guard for the full interval after a second-brood feeding. At both nests he occasionally stood guard during just a part of the female's absence, then disappeared, and at both he occasionally made repeated feedings—as many as five—while she was away. Now and then he made two feedings before beginning guard duty at the first nest.

Female's feedings. At both nests the female made her feedings almost exclusively upon returning from her own meals to resume brooding. At the first nest she brought food on almost all of those returns; at the second nest, on less than half of them. Not until the latter part of each brood's stay in the nest did she occasionally make one feeding, then fly directly away to find more food.

Female "trims" food. On the first few days of the nestlings' life the female took some pains to see that their food was readily digestible. She herself gave them only caterpillars and very small insects, and she kept an eye on the male's offerings. If he, too, had brought a caterpillar or particularly small insect she let him feed the young at once, but when his catch was an insect of any size, she picked off, and herself ate, such parts as the head and wings before rising and letting him feed the young. That procedure was seen on both of the first brood's hatching days, and again on the day the birds were three and four days old. It was seen once on the day the second brood was four to six days old.

On June 30, which was about the sixth day of second-brood incubation, there occurred an incident that seemed to be an anachronistic instance of food "trimming." While the female was sitting, the male alighted beside the nest with a caterpillar. The female arose, dabbed in the nest for some seconds, then in accordance with normal behavior

flew away to forage. Still holding the caterpillar, the male stood guard for 11 minutes. Then as the female returned he moved slightly so as to face her squarely and, after she had again used her bill briefly in the nest, she pulled the head off the caterpillar and ate it and immediately the male swallowed the remainder. This incidentally, was the only time that a caterpillar was seen to be trimmed.

Feeding troubles. Food which one nestling could not or would not swallow was taken from it and given to another bird. A caterpillar had been brought to the nest by the male. When it remained partly visible in the mouth into which he stuffed it, the watching female pushed or pulled at it several times. Then, that youngster still failing to swallow it, the male withdrew it and fed it to another.

On two other occasions parents misjudged the swallowing abilities of their young. The male once placed a mulberry in a nestling's mouth crosswise and had to pick it up and replace it twice before getting it in lengthwise so that it could be swallowed. Again, one adult (I believe the male) of a pair crossing the study territory with young tried three times to jam into the mouth of one fledgling a cherry too large for it even to hold, and only after these repeated failures began tearing the fruit to pieces and feeding it that way.

Out-of-nest feedings. After the young had left the nests, feedings were seen as follows: First brood: by the male, 28, of all three birds; by the female, 2, of one bird. Second brood: by the male, 10, of two birds; by the female, 2, of the third bird.

In addition, on the ninth day after her first brood left the nest, the female was once seen to feed one of two strange juveniles which with their parents had come into the territory four days earlier.

Posturing rare. Only once was one of the fledglings noticed to flutter its wings when fed. It was then 21 or 22 days old, and it hurried across a lawn toward the male with head thrust forward, bill open, and wings fluttering. A juvenile of the trespassing family likewise was seen just once to flutter when fed. No such behavior was seen while the young were in the nests.

Nature of food. Distinguishable food given the young during their nestling days was: hairless caterpillars, earthworms, red mulberries, white mulberries. Distinguishable food after they left the nest was: Japanese beetles, white grub, earthworm, hairless caterpillar, red, white and unripe mulberries.

Nest Sanitation

The nestlings' feces were almost always eaten by the parents, but a few times were carried away. When the female remained at the nest through feedings by the male, he did not wait for the excreta to appear.

The two or three occasions on which excreta were carried away—by both parents—all fell during morning twilight, although this was not the usual manner of disposal at that time of day. During my only

period of evening twilight observation, all excreta were eaten. At a nest of Robins (*Turdus migratorius*) which was studied sketchily, the one time out of six that excreta were carried away instead of being eaten also fell during morning twilight.

The Young

Fledging. All of the first-brood young left the nest June 12, when they were 12 and 13 days old. All of the second-brood young left the nest prematurely, upon being banded July 17, when they were 8 to 10 days old.

Flight powers. I did not see the young birds' very first flights, but on its initial day out of the nest one of the first-brood young made a flight of about 25 feet from a low bush to a perch 10 feet up in a tree. Two days later this brood was flying strongly. A juvenile of another pair flew 50 feet on a level course on its first afternoon out of the nest; that appeared to be the extent of its powers.

Habitat. On their first day out of the nest the first-brood young resorted to bushes, perching about three feet above the ground. Two days later they were found in trees, and positions 8 to 15 feet above the ground remained the rule until a week later when they began to do some of their own foraging. Thenceforth they divided their time between trees and the ground.

The second-brood young also showed the tendency to get above the ground. Having left the nest before they could fly, these birds were unable to get up into bushes, but on their second day at large they began to perch on stones a few inches high, and on spots a few inches up in fallen bush, which they could reach by climbing.

Dispersal. While entirely dependent, the fledglings whenever they could be found were scattered over the territory 28 to 60 yards from each other. After they began to do some of their own foraging, any two of the three first-brood birds might be found travelling together, either by themselves or in train of a parent.

When the young finally left the nesting territory they appeared to do so singly. Two first-brood birds remained four days longer than the third and then vanished seven hours apart. Two second-brood birds left something more than two hours apart, the third not until a day later; the first of these three and the adult female disappeared simultaneously and probably together, for the female was attending this bird when last seen; the male and the third juvenile likewise vanished at the same time; I have no idea whether the middle youngster, which had meanwhile disappeared, went over to the departed female's care, or was still under the male's and merely undiscoverable.

Period of dependency. At least one of the first-brood young was doing some of its own foraging by the age of 20 days, and all were by the age of 23; one still was fed when 31 or 32 days old, and the others

at least as late as 25 to 28 days. Last seen in the territory when 28 to 32 days old, all of the first brood presumably were independent when they left the area.

Number of Broods

Bailey (1913:351) states that "sometimes" two broods are reared by the Wood Thrush in Virginia. Weaver (1939:22) reports two broods raised by a pair at Ithaca, New York. Two seem to be the rule at Baltimore; Resler (1891:106) so judged from late dates for newly-fledged young, and not only did the subjects of my study raise two broods, but the color-banded male of a neighboring pair which fledged birds in mid-June was still casually observed through July 29, and in song through July 26, dates which suggest that he also nested again.

Weaver, watching a marked pair of birds, found as I did that the same ones remained together for the second nesting.

Territory

The initial territory was practically identical with the area described under *Habitat*. It included all of that city block except one edge, where paved driveways and a comparatively close placing of buildings reduced the amounts of lawn and shrubbery. This territory was just about 100 yards square. Other Wood Thrushes nested in all of the surrounding blocks; the one other nest that I searched out was a first-brood one 80 yards south-southeast of the study pair's first nest.

Between the two nestings there appeared to be a slight extension of territory northward, and when the second nest was built on the north edge of the original territory the birds made a pronounced extension in that direction, the neighboring thrush on the north having apparently moved away. The new territory was not determined precisely, but the birds—freely crossing a paved street—were seen to go at least 75 yards northeast of their second nest, while they also held onto the heart of their original block. Their final territory, therefore, must have been something like 125 x 100 yards.

These were suburban territories, then, of about 2 and 2⅜ acres; Weaver (1939:18) found territories in stream-side woodland to range from ⅛ acre to 2 acres.

Other birds nesting within these territories were: a number of pairs of Robins, a number of pairs of Starlings (*Sturnus vulgaris*), some English Sparrows (*Passer domesticus*), a pair of Catbirds (*Dumetella carolinensis*), a pair of Blue Jays (*Cyanocitta cristata*), and almost certainly a pair of Chewinks (*Pipilo erythrophthalmus*).

During both nestings there were innumerable encroachments upon territory by other Wood Thrushes. The interlopers used a bird bath, foraged, and sang on the edges of the study-pair's land, and usually with impunity since the nesting birds could not be everywhere at once. The outstanding invasion was one made between broods by another pair

with two semi-dependent young; this family stayed in the territory for five days and roved over practically every part of it. One of that pair, apparently the female, was a color-banded bird.

The nesting female was seen to defend territory twice and the male four times. On the other hand, the female once allowed a strange Wood Thrush to perch for half a minute and utter some little calls only three feet below the nest on which she was incubating her second set of eggs; she once foraged peaceably near the "female" of the trespassing family, and, as already noted, she once fed one of that trespasser's young. The male also once tolerated this "female," though he defended territory against its mate and one of its young.

The female's first defense of territory was seen May 10. She flew at a stranger on the ground a few times and then pursued it mildly as it withdrew from the territory. Her other defense was seen July 4: a stranger appeared on the ground 15 yards from the nest, and the female flew off her eggs with a burst of *quit* calls; she then hopped in pursuit, uttering at intervals a short explosive cry that had a musical quality and suggested rudimentary or vestigial song. About 20 yards from the nest, although the stranger was certainly still in the territory, the female turned back and began foraging; the other bird then disappeared.

Three of the male's four defenses were made against the trespassing family in the period between the two nestings. Once he flew at the supposed male and chased it out of the territory; once he seemed to be satisfied when by hopping toward this trespasser he made it retreat a short distance, for he himself thereupon flew away in the opposite direction. The other two defenses were more interesting, one because it seemed to be made against a juvenile, and the last because it was a battle of song.

In the case of the juvenile, the study male was in a mulberry tree when the "female" trespasser and her two young appeared on the ground below. After a minute and a half the male flew at the little group, and one of the juveniles fled. The other two birds paid no attention to the attack, and the study male then began to forage peaceably only a few yards from them.

The battle of song lasted seven minutes, and the nesting male was victorious. It occurred the morning of July 1, while the female was sitting on her second set of eggs. Thirty yards south of the nest the male was singing intermittently: song which at this date was no longer first-class, but rather weak in volume and slightly slow in pace. For 10 minutes he sang, then he changed to a variety of calls for half a minute, then he disappeared, and just as he did so a strange adult was noticed on the ground beneath his tree, and one of the study male's first-brood juveniles in another tree nearby. Soon the stranger flew up near the juvenile. In a little while the nesting male returned. He fed his offspring, then darted at the stranger, who fled to a tree some distance southwest, giving several phrases of song on his way. The nester, after

his little dash, alighted again near his juvenile and launched into loud, fine song. Almost at once the stranger also began singing loudly. At that, the nester moved to a tree nearer him; and when, after some minutes, the stranger made a slight advance, the nester also moved forward another short distance, so that finally the birds were singing only 8 or 10 yards apart. Seven minutes after the struggle by song began, the stranger apparently admitted defeat by turning silent, and presumably he flew away—he had been hidden by foliage at the last. The nesting male sang on for a quarter-minute more, then returned to his normal affairs.

These Wood Thrushes were very tolerant of other species in their nest-trees. While the female was sitting on her first set of eggs, Starlings three times, English Sparrows four times, and a Robin once, were seen to spend from a few seconds to several minutes in the beech without being molested. Some of those birds were in far parts of the tree, as much as seven yards from the nest, but others were only one and two yards from the sitting bird; also, some of them called, and scolded, and the Robin sang for a minute and a half. Likewise, while she was brooding her first nestlings the female permitted a couple of English Sparrows, a Starling and a Catbird to enter the tree. Once during the second nesting, while both Thrushes were absent from the tiny ailanthus tree, a Brown Thrasher (*Toxostoma rufum*) spent some seconds preening only two or three yards from the eggs without attracting either parent.

No such hostility to Robins as Weaver reports (1939:19) was shown by these Wood Thrushes; Robins nested within about 50 feet of both Wood Thrush nests, and no clashes were seen. The only birds of other species toward which hostility was displayed were a Blue Jay and a Purple Grackle (*Quiscalus q. quiscalus*), and these had not entered the nest-trees nor made any move to do so. On the first brood's last morning in the nest the female interrupted her covering of them when a Jay appeared, foraging and calling, in a tree 25 yards away. She flew to a wire near that tree; soon the male also appeared, and both began steady calls of concern; then the male flew into the Jay's tree and continued his calls there. Some Robins and a Catbird were attracted, and they joined in the scolding. None made any attack, however, and after three minutes the Jay flew away of its own accord. In contrast, on the second day of the second-brood hatch, a Jay which appeared briefly only 10 yards from the nest was engaged by a Robin, but the female Wood Thrush continued to sit and the male did not appear. The Grackle was attacked by the male when it appeared on the ground 10 yards from the second nest, which then held young 4 to 6 days old; the Thrush flew at the Grackle several times, and in a minute or two the Grackle went away.

Voice

MALE. The male sang regularly from his arrival on April 29 through the morning of July 8, which was the second of the three days of second-

brood hatching. After that, he was observed to sing only July 12 and 15, and then only a few poor phrases. Other Wood Thrushes sang with considerable regularity as late as August 2; the last song was heard August 15. Weaver (1939:20) states that at Ithaca "there was song in the evening only, after the young had left the nest"; there was song in my bird's territory every morning of the period between broods, and the singer was once searched out and confirmed as the breeding male. Other notes given by the male were:

Cheuh-heuh-heuh-heuh. The commonest call; sometimes one or two syllables longer or shorter; unaccented or the last syllable slightly accented. Apparently the call which Weaver writes *"Trrrrrr."* Used, as she records, to indicate uneasiness, and also apparently as a location note.

Strings of as many as five "quit's." These are the *pit* and *quirt* notes to which Chapman (1940:413) and Weaver (1939:19) give opposite meanings, and which seem to vary slightly in sound only because of differences in force of utterance. Sometimes given calmly, and the meaning then not clear. Usually given very loudly and excitedly, and then they indicated great distress and served as a battle cry and a call for aid.

Heeh. Always given singly. Possibly denoted excitement. This apparently is the "squeaky whistle" listed by Weaver, but it was never used during my observations to urge the female off the nest or to urge the young to eat, as noted in the Ithaca study.

A low-pitched rattle or trill varying in length. Meaning unknown. Given three times as the male flew from the nest-tree: twice upon the female's return from a foraging trip, ending his guard duty; once upon his departure seven minutes after she had returned from foraging. On one of the occasions the nest held eggs, on two it held young. Another male was once observed to give this note under similar circumstances: as he flew from a guard post near his nest-tree upon the female's return to their young.

FEMALE. The female used the *cheuh-heuh-heuh-heuh* call in the same ways as the male. Once she gave one or two of these calls while standing beside the nest, and twice she gave one immediately after going on the nest to incubate. A queer-toned variant, more nearly a whistle than usual, was given by her several times when I approached her fledged young, and once when the squeals of an unrelated young Wood Thrush attracted her to the banding trap.

The strings of loud and excited *quit's* also were given by the female: once while defending territory against another Wood Thrush, and a number of times as she struck at a small mirror mounted on a pole, which was used to see inside her second nest. Similar uses of these notes are recorded by Weaver.

The only other note heard from the female was the explosive and somewhat musical one uttered during a defense of territory and already mentioned under *Territory*.

YOUNG. The first-brood young were not heard to make a sound until their last morning in the nest, when at the age of 12 and 13 days one or more gave some little *chip's* or *chik's*. The young—exact age unknown—in another first-brood nest were giving such calls on the day before they took wing. The study-birds' second-brood young were silent throughout their nest life; however, as soon as they left the nest (prematurely, at the ages of 8 to 10 days), they began uttering this same note—a fact which shows its character as a location call. I recorded this note at various times as *tsih, chik, chip, tsip, tseep,* and *cheep,* its quality depending considerably upon its volume.

When last seen (at the ages of 10 to 12 days), the second-brood young were still giving the above note exclusively. By the age of 21 days, when they were partly independent, the first-brood juveniles had begun to give *tih-tih's* as well, and soon these calls were lengthened to three, four and even more syllables, so that they seemed to be a rudimentary form of the adults' *cheuh-heuh-heuh-heuh*. The earlier *chip* notes were continued, however, to the age of at least 32 days, when these juveniles disappeared.

A loud burst of *quit's* identical with those of adults was given by a fledgling just a few hours out of the nest, when it was chased.

ALBINISM

The female's albinism consisted of one white feather in the crown a short distance behind the right eye, some white feathers among the upper tail coverts, and four white rectrices. The six young of the two broods were color-banded while still in the nest; no sign of albinism was seen up to the age of 32 days with the first brood, 12 days with the second.

Knight (1940:574) states that among ten broods of young raised in five years by a partly albino (male?) Robin there were no albinistic birds. Smith (1934:109) reports that albinistic touches did appear in the offspring of a partly albino female Robin.

SUMMARY

A pair of color-banded Wood Thrushes in suburban Baltimore remained together through two broods of three young each; nesting success was 100 per cent.

The second nest was built 90 yards north-northeast of the first; the general locations of the two were similar; the placements differed.

The immediate proximity of a stream was not found, as by some other observers, to be a habitat requirement.

The female alone incubated. Attentive periods at the first and second nests averaged 31 and 27 minutes, respectively; inattentive periods 8½ and 6⅒ minutes; the percentage of daylight hours spent on the nest was 78 and 80.3.

The incubating bird's behavior during rain and during high wind is described.

The first-brood hatch extended over two days, that of the second brood over three. The hatching hour of one egg was 6:59 A.M., 2 hours 17 minutes after sunrise. The shell was carried away.

The female alone brooded the nestlings. Brooding lasted throughout the young's nest life. No progressive daily decrease in the brooding was found, nor any clear correlation between weather and amount of brooding except at temperatures of 93° F. and above, when attentiveness changed from covering to mere attendance—without shading.

Both parents fed the young. The male made many more feedings than the female, but the female showed the better appreciation of the nestlings' needs; on the young's first days she gave them softer food than did the male, and she also trimmed certain portions away from some of the food he tendered.

During comparable series of observations the average rate of feedings at the first nest was 9.3 per hour, at the second nest only 4.7, with equivalent food loads.

Both parents were somewhat less attentive to the second brood than to the first. For example, the male guarded the first nest between almost all of the female's sittings, but guarded the second during only 60 per cent of her absences. At the first nest single periods of brooding by the female often encompassed two or three food trips by the male, but the female almost always flew away from the second nest the moment her mate arrived. The parents were equally responsible for the 50 per cent drop in feeding rate from brood to brood.

The nestlings' excreta were usually eaten, by both parents, but two or three times, during morning twilight, were carried away.

All of the first brood left the nest on the same day, when 12 and 13 days old. These birds were doing some of their own foraging by the age of 20 and 23 days; they continued to be fed by the parents to the age of 25 to 32 days; they left the territory, presumably independent, at 28 to 32 days.

Two broods seem to be the rule at Baltimore.

First-brood territory was about 100 x 100 yards in extent, second-brood territory probably 100 x 125 yards.

Both adults defended territory against their own species, but not especially vigorously; the observed defenses are described. On the other hand, the female once fed a juvenile of a trespassing family that remained in the territory five days. The study pair were very tolerant of several other species, displaying hostility only toward a Blue Jay and a Purple Grackle.

The notes uttered by male, female, and young are described, with comment on their uses; the female's use of a note suggesting song is mentioned.

Partial albinism in the female was not inherited in the juvenal plumage by any of the six young.

LITERATURE CITED

BAILEY, HAROLD H.
1913 The birds of Virginia, Lynchburg, Va.

CHAPMAN, FRANK M.
1940 Handbook of birds of eastern North America. New York.

COOKE, MAY THACHER
1929 Birds of the Washington, D. C., region. *Proc. Biol. Soc. Wash.*, 42:1–80.

DUGMORE, A. RADCLYFFE
1900 Bird homes. New York.

KNIGHT, CHARLES H.
1940 An albinistic Robin. *Auk*, 57:574.

RESLER, ARTHUR
1891 List of birds resident in summer near the city of Baltimore. *Trans. Md. Acad. Sci.*, 1891:105–138.

SMITH, O. WARREN
1934 An albino Robin. *Bird-Lore*, 36:109.

WEAVER, FLORENCE G.
1939 Studies in the life history of the Wood Thrush. *Bird-Banding*, 10:16–23.

3201 CARLISLE AVENUE, BALTIMORE, MARYLAND

BIRD DISPLAY. AN INTRODUCTION TO THE STUDY OF BIRD PSYCHOLOGY. By Edward A. ARMSTRONG. Cambridge at the University Press; Macmillan Co., N.Y. 1942: 5½ x 8½ in., xvi + 381 pp., 22 pls. $5.50.

The study of bird psychology has only recently emerged from its anecdotal, anthropomorphic stage, and this excellent handbook will probably surprise many students, who, because the literature has been so extremely scattered, have not realized the extent of the progress we have made. Armstrong has not only assembled, correlated, and interpreted this literature, but has wisely included the full references which provide the evidence for his statements. If we question a generalization, we can promptly turn to the original sources and form our own conclusions.

The author's fine admonition to students of bird behavior demands quotation in full:

"An interesting observation of a bird's behaviour should be no less carefully recorded and reverently preserved than the type specimen of a new subspecies. Lack of regard for this principle has long prevented the outdoor study of birds from being considered much more than the harmless hobby of men who preferred looking at birds to killing them. Now that field ornithology is increasingly recognised to be a serious scientific discipline from which careless observation and wanton generalisation should be sternly excluded, it is essential that its literature should eschew the vagueness which has hampered the progress of bird-behaviour studies in the past. It is not enough to be told that birds do this or that; we should be told what reliable observer has seen them do it."

This book contains such a profusion of quotations from many sources that inevitably some will be criticized by any reader. There is, for example, the description of the dance of the Sharp-tailed Grouse (p. 73), which is based on a long out-dated, and in part anthropomorphic, account, and to which Armstrong adds a probably erroneous statement. One even turns up (p. 13) the old misconception of birds sleeping with the head under the wing. But perhaps the worst example is the quotation in full (p. 185) from a recent best-selling novel (!) of an apparently imaginary description of the dance of the Whooping Crane.

The book is handsomely illustrated with 40 photographs by the author and others. There is a bibliography of nearly 700 titles, a good index, and a separate list of the scientific equivalents of all bird names used in the text.—J. Van Tyne.

TERRITORIALITY, DISPLAY, AND CERTAIN ECOLOGICAL RELATIONS OF THE AMERICAN WOODCOCK[1]

BY FRANK A. PITELKA

FOLLOWING the appearance of Pettingill's monograph (1936) on the American Woodcock (*Philohela minor*) attention was drawn to our limited evidence for territoriality in that species (Linsdale, 1936). Recently, however, Norris, Beule, and Studholme (1940) and Studholme and Norris (1942) have published limited observations which touch on the problem of territoriality. With the same problem in mind, in the early spring of 1939, I undertook to study a small concentration of Woodcocks on a semi-wooded plot north of Crystal Lake Park, Urbana, Champaign County, Illinois.

Figure 1. Habitat of the Woodcock. Photograph taken facing west near upper end of north-south road in territory C (Figures 3 and 5); east-west road is seen in right background. All of the open area seen in this photograph constituted part of male C's display territory; his feeding area was located in the woodland seen in left background.

The area of study, approximately 45 acres in extent, is illustrated in Figures 1 to 3. The open portions of this area were used by Woodcocks as "singing-fields" for their crepuscular displays. During the day, Woodcocks were confined largely to the wooded and more densely vegetated portions within the northern half of the area. The patch of relatively dense deciduous woodland (Figure 1) contained white oak (*Quercus alba*), red oak (*Q. rubra*), ash (*Fraxinus* sp.), shagbark

[1] Contribution from the Zoological Laboratory of the University of Illinois.

hickory (*Carya ovata*), and elm (*Ulmus americana*). Thickets to the southeast of the main wooded area contained large hawthorn shrubs (*Crataegus* sp.), honey locust (*Gleditsia triacanthos*), and young elms. Additional hawthorns, elms, and a few sycamores (*Platanus occidentalis*) were scattered over the open area partially encircled by the old stream bed or "ox-bow" (Figure 3), which was bordered largely by willows (*Salix* sp.). The ground cover of this open area consisted only of matted dead vegetation (largely grasses); the leaf-littered floor of the wooded area was overlain with the usual stratum of small shrubs. Within a haw thicket and woods of the northern half of the study area, there were small shallow pools, the edges of which were frequented by the Woodcocks. Several recent studies of the American Woodcock include data of interest on habitat preferences (Aldous, 1938; Merovka, 1939; Studholme and Norris, 1942).

Figure 2. Westward view across display territories of males B and A, showing "open" portions of study area, as indicated in Figure 3.

Observations extended from early March to mid-April and totalled approximately 40 hours. The Woodcock was first recorded on the study area on March 5, when a single bird was flushed by J. Murray Speirs. Crepuscular calling and singing of the males was noted from March 9, when at least two performing males were present, through April 3. It is possible, since no observations were made between March 5 and 9, that calling and singing began prior to March 9. Following April 3, no Woodcocks were detected on the area, and apparently none remained to breed that season. Observations included 10 full evening performances and one morning performance (Table 1).

TABLE 1

SUMMARIZATION OF CALLING AND SINGING PERIODS

Date	Birds Studied[1]	Calling Periods	Pre-display Calling	Singing Periods	Post-display Calling	No. of Singing Birds	No. of Calling Birds
Mar. 9		(Flight displays)				2	2
10		(Flight displays)				3	5
13	B	6:05–6:50 P. M. 45 min.	15 min.	6:20–6:50 P. M. 30 min.	0 min.	4	6
14	A	5:40–6:42 62	33	6:13–6:40 27	2	3	5
17	A, B	6:13–6:24 11	—	*None* —	–	0	3
20	A, B	6:09–6:51 42	14	6:23–6:46 23	5	3	6
21	A	6:14–6:58 44	12	6:26–6:54 28	4	7	7+
	C	6:11–6:52 41	7	6:18–6:51 33	1	–	–
22	C	6:09–7:00 P. M. 51	15	6:24–6:56 P. M. 32	4	5	8
24	C	4:45–5:26 A. M. 41	13	4:58–5:26 A. M. 28	0	5	5+[2]
27	A, B	6:30–7:06 P. M. 36	4	6:34–7:00 P. M. 26	6	3	4
28	A, B	6:33–6:59 26	3	6:36–6:58 22	1	3	3[3]
31	B	6:39–7:01 22	4	6:43–6:57 P. M. 14	4	2	3
	A	6:50–6:59 9	—	*None* —	–	–	–
Apr. 3	A, B	6:36–6:54 P. M. 18	—	*None* —	–	0	2

[1] In this column are listed the males, as designated in the text, to which particular attention was paid on different dates.
[2] Following this morning singing period, a systematic survey disclosed the presence of at least 12 Woodcocks.
[3] An additional individual was found on the feeding area of male A just before calling began.

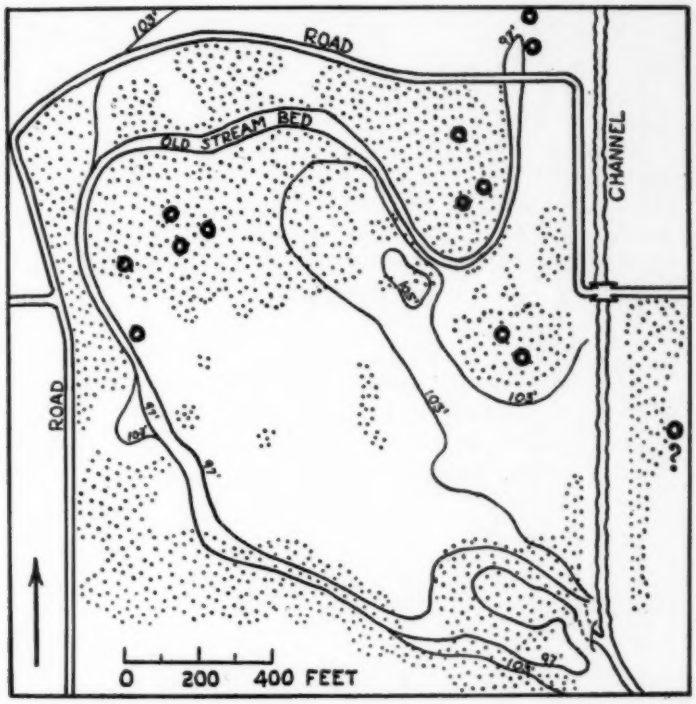


Figure 3. Map of study area. Dotted portions represent areas covered with woodland or relatively tall and dense thickets; clear portions represent areas covered with grasses, forbs, and numerous scattered shrubs, and a few small trees. Small dark circles indicate distribution of Woodcocks over feeding areas following the morning display period of March 24.

Weather data (Figure 4) were provided by the University of Illinois Meteorological Station through the kindness of H. P. Etler. Supplementary field measurements of temperature were made with an ordinary mercury thermometer. Data on light intensities were obtained with an illumination meter (Model 603, Weston Electrical Instrument Corp., Newark, New Jersey). For the loan of field equipment, I am indebted to S. C. Kendeigh and V. E. Shelford, and to the Department of Zoology, University of Illinois.

Acknowledgement is made gratefully to Mrs. Margaret M. Nice, S. C. Kendeigh, J. T. Nichols, and especially to O. S. Pettingill, Jr., for critical reading of the manuscript. I wish also to thank Mr. and Mrs. J. Murray Speirs for their field notes on the Woodcock, also recorded at Urbana; J. T. Nichols for records of song-flights and nesting of the Woodcock on Long Island; and C. T. Black for excerpts from the manuscript notes of I. E. Hess, formerly of Philo, Illinois.

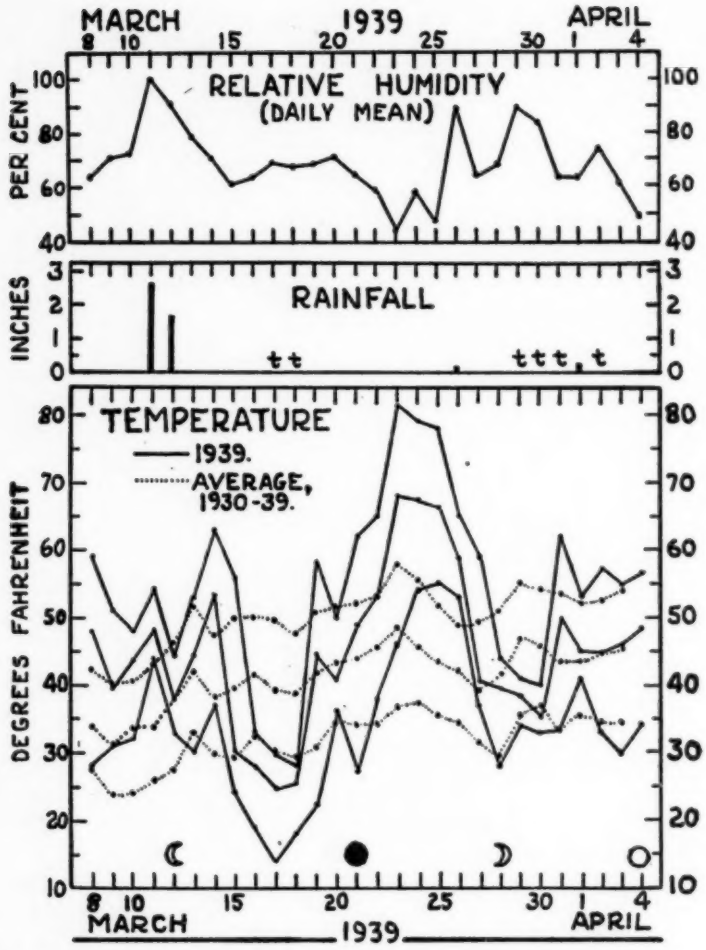


Figure 4. Weather data for the period of observation. In the graph of temperature data, daily values include minima, means, and maxima. In the graph of rainfall, t = trace. Moon phases are shown in the lower part of the figure.

The Problem of Territorialism

In the American Woodcock, habitat and spatial relations are relatively complex. Within the period and geographic range of breeding, the male confines himself to a feeding area (usually wooded—the "diurnal territory" described by Pettingill, 1936:280) except for excursions to an adjoining display ground (= open-country territory or the singing-field) during crepuscular or nocturnal periods. Feeding areas may be temporary, largely because of weather factors, and they undoubtedly shift with the advance of the spring and summer seasons.

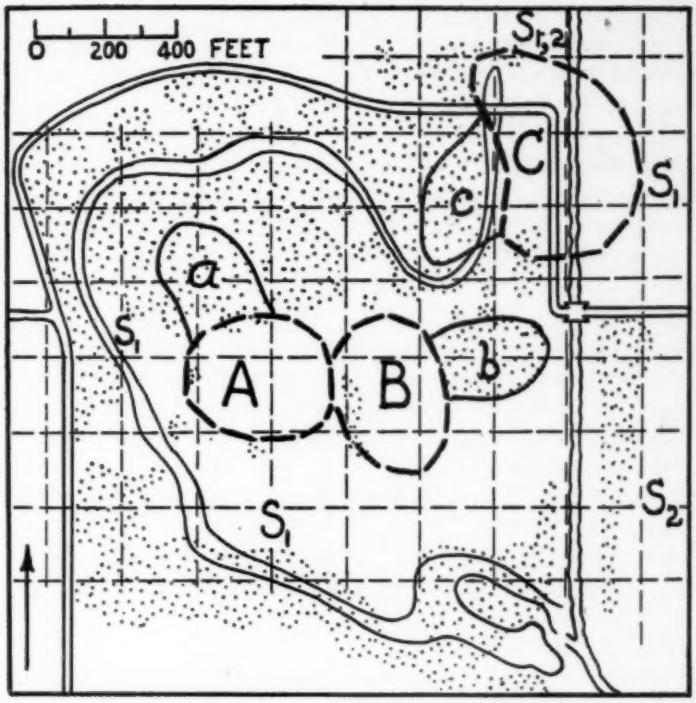


Figure 5. Open-country display territories (*A*, *B*, *C*) and adjoining feeding areas (*a*, *b*, *c*) of three male Woodcocks. Distribution of additional singing males is shown for March 21 (S_1) and 24 (S_2).

Following mating, the female occupies an area within which the nest is placed. This she leaves periodically to feed at sites at variable distance from the nest. The female performs all nesting duties, and, except for mating, the two sexes apparently remain independent of each other.

The question now remains, does the male or female display territoriality within one or more parts of the breeding habitat occupied by the species? Various aspects of this question are considered below, but to simplify the discussion, it may be stated at the outset that only the display sites of the male Woodcock are known to be defended, and only these areas will be termed territories.[2]

My observations were made largely on three males (A, B, and C) which remained established on fairly definite feeding and display grounds throughout the period of study. The display territories and feeding areas of these males are shown in Figure 5. The territorial boundaries shown are based on (1) location of calling posts on the

[2] The term territory, as used here, will refer to any defended area. This follows recent usage by Nice (1941:441) and other investigators.

ground, (2) spatial extent of the display flights, and (3) territorial claims as evidenced by threat behavior and chases. These points are all discussed in the following sections. The feeding areas were determined by repeated observations of individuals within the limits shown, and of the emergence of each of the males A, B, and C, from his respective feeding area prior to display. Whereas these birds were not marked, all evidence drawn from their behavior leads me to conclude that the same birds held the same territories throughout the period of occupancy.

During the four-week observation period, there were, besides females, at least five additional displaying males on the study area. The latter were present for only one to three days. In Figure 5, locations of singing males other than A, B, and C are shown for March 21 (S_1) and March 24 (S_2). It was not feasible to census the study area repeatedly, but such data as are available indicate that numbers of individuals increased to March 21, when there were between 10 and 15 Woodcocks present. On March 22, Speirs estimated that there were 14 in the area. On March 24, following a morning singing period, a systematic census count revealed at least 12 Woodcocks (Figure 3), although only 5 of these had performed (Figure 5).

Call Notes

1. *The* Peent *Note and Crepuscular Calling Periods.*

The harsh, loud, nasal note given repeatedly by the male on the display territory has been expressed verbally in numerous ways (Pettingill, 1936:292). *Peent* is one of the more acceptable renditions and is used throughout the following discussions. Apparently both sexes may call on the display territory of one male, although calls of birds other than the occupant male are given only intermittently and briefly (see also Brewster, 1937:168). In some instances the *peents* of several birds on one territory may sound similar, but in several instances, it was possible to distinguish *peents* lower pitched than those of the performing males. Pettingill (1936:294) has suggested that the lower-pitched calls may be those of females, and a difference in the quality of calls between the two sexes has also been suggested in the European Woodcock (*Scolopax rusticola*) by Pay (see Steinfatt, 1938:389).

On March 28 and 31, males A and B both called a few times from their respective feeding areas before flying to their display territories. Pettingill (1936:282, 296) and Brewster (1937:170) also cite instances when calling began on feeding areas. Generally, however, calling began almost immediately after arrival on the display territory. One bird began the calling, others followed, and calling continued up to the first flight song; thereafter periods of calling alternated with song. During the preliminary period, all individuals exhibited an acceleration of calling, probably synchronized with the approach of darkness. The number of

calls given per minute prior to the first song ranged usually from 6 to 20 (Figure 6). For male A, however, the maximum rate, recorded just before the first song, was 26 calls per minute. If no interruption occurred, it maintained this rate between songs during the height of the display period. In this respect, male A differed from the other birds, with whom the rate of calling was lower, as a rule, between songs than before the first song. Pettingill (1936:294) records a maximum of 27 calls per minute between flight songs.

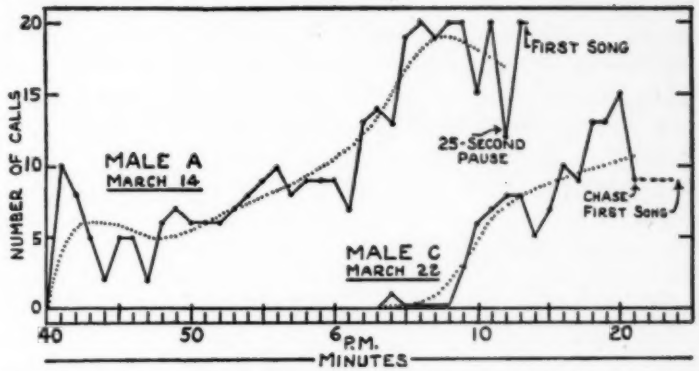


Figure 6. Two examples of preliminary calling periods of the male Woodcock, showing acceleration of calling prior to display.

A preliminary calling period may be illustrated by a record of calls given by six birds scattered over the open area south of the woods on the evening of March 13. From 6:05 to 6:10, bird 1 called alone, giving four calls. From 6:10 to 6:15, 23 calls were given by bird 1, and 17 by bird 2; bird 3 called once. From 6:15 to 6:20, 34 calls were given by bird 1, 27 by bird 2, and 15 by bird 3. Birds 4 and 5 each gave four calls during this five minutes, and bird 6, three. The first song began at 6:20.

Neighboring males A and B consistently called more frequently during territorial occupation than male C, whose "neighbor troubles" were only intermittent. This type of competition is also seen in the observations of Norris *et al.* (1940:14) who, by imitating the *peent* note, stimulated established males to call more vigorously and to attempt assault on the "intruder."

The lengths of calling periods (including the singing periods from the beginning of the first song within an evening's performance through the last song) are summarized in Table 1. Calling periods are equivalent to total time spent on the display territory. During this time, the *peent* note is given continually, except for interruptions by flight display.

Given the suitable habitat, the chief factors which enter into the variation among calling periods of established birds are light intensity,

weather (especially temperature), and psychological stimulation exerted among neighboring individuals. Other factors affecting calling (and display as well) are not to be overlooked: the presence of females may influence calling and display; and the strength of the sexual urge in relation to particular time of the breeding cycle would be reflected in the length of calling and display periods (Studholme and Norris, 1942:233). During the early part of the breeding season, the complex of environmental and physiological factors which influence migratory movements may be superimposed on the previously mentioned factors, and birds seemingly established in suitable habitat may depart after subsidence of territorial calling and display (see below).

Light intensity.—Light measurements were taken on display grounds. The receptor piece of the illumination meter was placed on clear ground six feet away from the recorder and directed toward the zenith. During evening and morning observation periods, readings were taken every five minutes (Figure 7). Measurements were also taken with the receptor piece six feet above the ground and directed toward the sunset, but because of certain irregularities in the data, these were discarded. Moreover, the bird on the ground is obviously affected more directly by light of the zenith.

TABLE 2

RECORDS OF LIGHT INTENSITY AND TEMPERATURE AT THE BEGINNING OF CREPUSCULAR CALLING

Date	Beginning of Calling	Light Intensity (Foot-candles)	Temperature (U. of I. Sta.)	Field Temperature
March 20	6:09 P. M.	17	38°F.	
21	6:14	11	53	
22	6:09	28	56	
27	6:30	2	37	36.5°F.
28	6:33	1.5	38	37.0
31	6:39	2.3	52	51.3

The amount of illumination at the beginning of calling on the display territory showed an appreciable variation (Figure 7 and Table 2). On March 22, calling began at 28 foot-candles, whereas on March 28, it began at 1.5 foot-candles. The average of six records is 10.3. Pettingill (1936:297) reports only one measurement, of two foot-candles, obtained with an exposure meter directed toward the sunset.

The possibility that the start of calling might be related in part to temperature does not appear to be supported by the available (admittedly limited) data (Table 2). The beginning of the calling periods may be determined by the time of departure from the feeding area, and therefore by the light intensity at the site of departure. Since such areas are visibly shaded by even leafless winter vegetation, the features of the particular site which the bird occupies would affect the onset

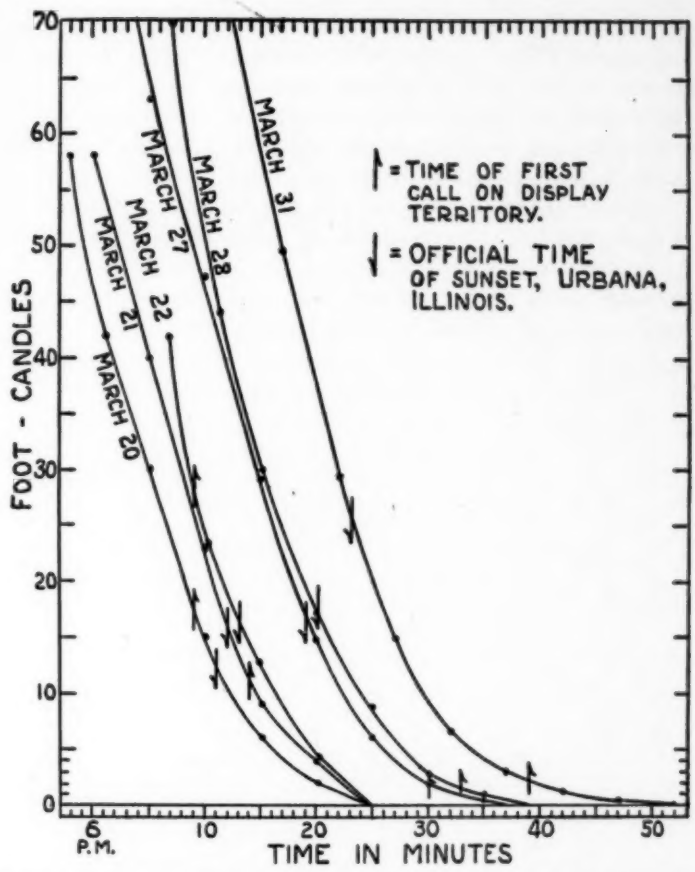


Figure 7. The time of first evening call in relation to light intensity. Each line represents declining light values during one evening. A symbol on each line indicates time of first call on the display territory in relation to light intensity at that moment. Light readings (taken every five minutes) are shown by points along the lines. (See also Table 3.)

of calling. It was observed, in fact, that Male C, whose feeding area was at the eastern end of the forested area and therefore less lighted in the evening, consistently appeared on his display territory before males A or B on theirs. Accurate arrival times for all males are available for three evenings:

	A	B	C
March 21	6:14	6:14+	6:11 P.M.
March 27	6:30	6:30+	6:23
March 28	6:28	6:30	6:24

The rate of calling and the time calling begins are both affected in any one bird by the activity of neighboring birds. Calling begun by

one bird stimulated others to leave their feeding areas to take up positions on singing fields. Calling was sustained at higher rates (20 to 26 calls per minute) during periods on March 20, 21, and 22, when Woodcocks were apparently most numerous on the study area (Table 1). On each of these evenings, calling also started relatively earlier.

The effect of cloudiness on length of calling period is seen on March 14, a dull, hazy evening, when calling began 24 minutes before sunset and continued for 32 minutes before the first song-flight (Table 3). On six more or less clear evenings (March 20-31, Table 3), calling began 4 minutes before, to 16 minutes after, sunset and continued for only 3 to 15 minutes before the first song. (See also Pettingill, 1936:297.)

TABLE 3

BEGINNING OF CALLING AND SINGING IN RELATION TO SUNSET
(URBANA, ILLINOIS, LATITUDE 40°N.)

Date	Time of Sunset	Beginning of Calling	Interval after Sunset[1]	Beginning of Singing	Interval after Sunset[2]	Sky Conditions
March 13	6:03 P. M.	6:05 P. M.	2 min.	6:20 P. M.	17 min.	?
14	6:04	5:40	-24	6:13	9	Cloudy
17	6:07	6:13	6	—	—	Clear
20	6:11	6:09	- 2	6:23	12	Clear
21	6:12	6:14	2	6:26	14	Clear
22	6:13	6:09	- 4	6:24	11	Clear
27	6:19	6:30	11	6:34	15	Clear
28	6:20	6:33	14	6:36	16	Partly cloudy
31	6:23	6:39	16	6:43	20	Clear
April 3	6:26	6:36	10	—	—	Clear

[1] Average of these 10 records is 3 minutes after sunset.
[2] Average of these 8 records is 14 minutes after sunset.

Temperature.—A correlation of length of calling periods with temperature is shown in Figure 8. Two temperature values are given for each date: value at time of calling and the day's mean. This diagram illustrates the effect of temperature *at the time* of the evening or morning calling periods. The *daily mean* temperature, shown in Figures 4 and 8, may serve as an index to the day-to-day changes, and undoubtedly the summated effect of these changes is reflected in the general physiology of the bird; that is, a Woodcock's crepuscular performance may be influenced as much by the temperature conditions of the preceding 24-hour period as by temperature at the moment of display. At least for evening periods, lengths of calling periods appear to correlate more consistently with daily mean temperatures than with temperatures during the calling periods. At best, however, these data are only suggestive.

On March 27 and 28, there was less preliminary calling, and during singing periods, performances began to be less frequent and less

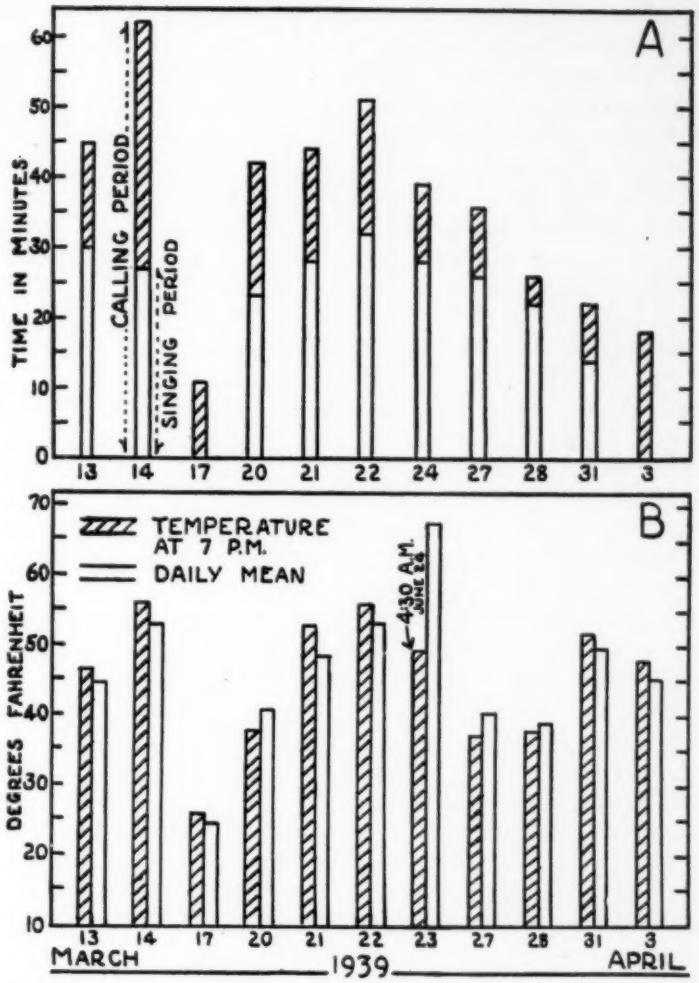


Figure 8. Correlation of daily temperature values with lengths of calling and singing periods; note that the total time designated as a calling period includes the singing period.

forceful. The data are too limited for an explanation of this subsidence of calling and display and of the ultimate disappearance of all the birds. The species is a summer resident in the region, although at present it is probably not regularly so. The weather record (Figure 4) shows unseasonably high temperature during the period March 22 to 27. Following this period, the birds apparently dispersed; on March 31, males A, B, and C were still present; on April 3, only males A and B were present, and on April 4 and thereafter, no Woodcocks were found.

During the cold evening of March 17 (temperature 26° F.), there was only a brief period of activity. No songs were given. At least three individuals called; the maximum number of calls was five within one minute, given by a single bird. Otherwise, however, no effect of temperature on *rate* of calling was detected. Of interest here is Brooks' record (1935:308) from West Virginia of a male calling and singing on April 27, 1930, when the temperature was 30° F. It remains yet for someone to determine whether the temperature thresholds for calling and singing are the same throughout the breeding season or whether these thresholds fall as the season advances (Witherby *et al.*, 1940:187).

2. Other Calls.

A second frequent note may be interpreted as *ka-kak-ka-k-k-k,* referred to in my subsequent discussion as a cackle. It appears to function in assault and threat, while the *peent* note appears to be one of warning, announcement, and advertisement. The cackle was heard most frequently when Woodcocks were most numerous. On several occasions the occupant of a territory was observed to give the cackle note during a preliminary, somewhat circular, flight just above the low vegetation. These flights occurred well after the calling had begun and from 3 to 10 minutes before the first song-flight. They were accompanied by a continuous whirring of the wings as heard at the onset of the song-flight. The cackle note was also given by an established male in silent flight just as it approached an intruder, whose calling had disclosed his position. All intruders were assaulted in this way. In some instances, the assault was followed by a chase, in others by a display flight, either from the site of intrusion or from the male's usual territorial position (see also Brewster, 1937:170). Also, the initial ascent in a song-flight was interrupted by slight dips marked by the cackle note (Figure 10, F). One particularly belligerent male (C) uttered this note on several occasions just as he alighted on his territory after a flight. Here, it seemed likely that the calls were evoked by the light-instruments placed close to the bird's favorite ground or by my crawling along the ground nearby. Once the cackle note was heard on A's feeding area, just prior to his flight to the display territory.

Norris *et al.* (1940:13) observed that Woodcocks flying over a singing-field were chased by the occupant male, who uttered the cackle note. Further, they observed that the *peents* of birds near a male in his singing field produced the same reaction. Pettingill (1936:268, 305) also observed that the cackle note was given when several birds were present in the vicinity of a singing-field, and he interpreted it as a note of reproof. Later, he observed two birds thought to be male and female and again heard the cackle note. He suggested that females may cackle also and referred to cackling as notes of felicitation or "talking sounds." My observations do not support that interpretation. I found that males uttered the cackle sound when assaulting any intruder and

when invading a close neighbor's territory and attempting to displace him (see below). In these and other usages described above, the note seemed clearly to function as an intimidation device. Only the territorial males produced this sound. I suspect that if not assaulted, another Woodcock present on a display territory would be a receptive female. There appear to be no published records of anyone's collecting and sexing suspected females on display territories. Trautman (1940:249) collected a suspected female in a display flight; it proved to be a male.

The third important note given during the crepuscular performance is a softer call interpreted in my notes as *ka-rurr*, recorded by Pettingill (1936:268) as *took-oo*. When the listener is only a few feet away from the bird, the note has a rolling quality evident in the first transcription; at greater distances, the note sounds softer, as in the second. In my own case, I could not hear this note at distances greater than 15 feet. The call is given one to three times between *peents*, each *took-oo* note except the last, which is followed immediately by a *peent*, being followed by a brief pause (Brewster, 1894:292; Pettingill, 1936: 294). The observations of Norris *et al.* (1940:12) would indicate that the *took-oo* note is one of invitation and solicitation prior to and after copulation. They report that a male approaching a decoy, prior to treading, utters only the *took-oo* note. Brewster (1937:168) suggests that this note is also given by the female.

DISPLAY OR SONG-FLIGHTS

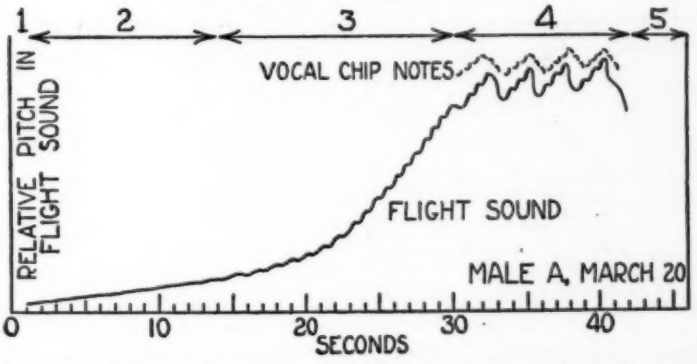


Figure 9. Pattern of sounds and time-relations observed in the song-flight of a male Woodcock. Divisions of the display, according to discussion in the text, are shown along the upper margin.

While the literature on the song-flight of the American Woodcock is extensive, most of it really states little more than that the performance is a truly phenomenal sight. Brewster (1894) and Pettingill (1936) have given us the best word pictures of the song-flight. In adding further to the literature, I am interested not only in elaborating

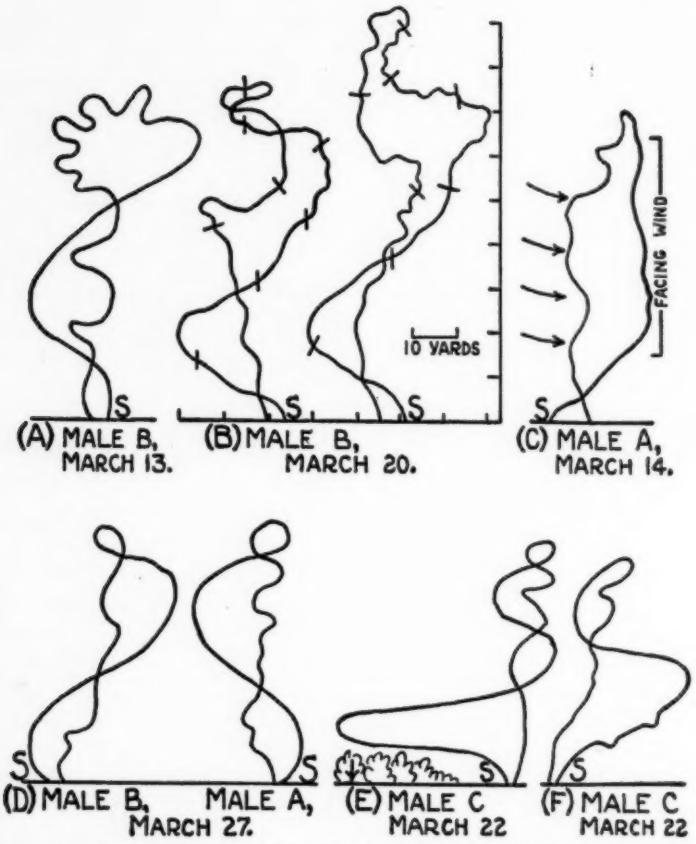

10 YARDS
FACING WIND
S
(A) MALE B, MARCH 13.
(B) MALE B, MARCH 20.
(C) MALE A, MARCH 14.
(D) MALE B, MALE A, MARCH 27.
(E) MALE C MARCH 22
(F) MALE C MARCH 22

Figure 10. Courses taken by song-flights of male Woodcocks, all viewed from the side. Ascent begins at S. (A) Generalized pattern of the flight, based on a series of flights of male B. (B) Two flights of a single male with five-second intervals marked by cross-lines to show time relations. A scale is added to show approximate breadth and height of flights. (C) A flight performed in a fairly strong wind. (D) Courses of flight displays of competing neighboring males. (E) Flight of a male who began to ascend near a neighboring male (position of latter shown by small arrow). (F) Flight of a male showing dips in steady ascent during which the cackle note was given toward another male (S_1, Figure 5).

and amplifying certain details of the song, but also, and more importantly, in presenting a simplified and somewhat graphic picture of it in order to provide some basis for comparison with other Scolopacinae. Typical performances are illustrated in Figure 10, A and B.

The display of the Woodcock may be divided conveniently into five parts: initial silent flight, regular ascent, pulsated ascent, climax of wing and vocal sounds, and silent descent (Figure 9). (1) The start of a song-flight is silent and lasts but a few seconds. (2) The whirr of the wings is then heard with a gradual rise in the pitch as the bird

begins to climb slowly in a large regular spiral about the point of beginning; this part of the song-flight usually lasts about 15 seconds. (3) During the third part, which is the greater part of the ascent, there is a pulsation in the whirr of the wings, which becomes increasingly pronounced; at first there seems to be a distinct sound, *zzet,* alternating with each whirr of wing sound; toward the end of the main ascent, when the wing pulse is quick, these notes are obliterated. (4) At or near the peak of the ascent, the wing sounds become most distinct and are given in series of three or four, alternating with *zzet* sounds, which are again audible. This is followed by dips and irregularities in flight, during which wing sounds are reduced. Corresponding to these dips, there are series of vocal chip notes, sometimes termed "twittering" (Figure 9). The fact that the *zzet* sounds are heard during the series of chip notes suggests that they are wing sounds. This climax period in the song-flight lasts 10 to 15 seconds and may include part of the descent. (5) It is followed by a rapid and silent dive-descent to a spot near the starting point.

Exceptions to this general picture are seen in the behavior of male C, whose singing-field was enclosed in part by tall vegetation (Figures 1 and 5). He was observed to precede an ascent by a silent flight to a point about 150 feet away, where the sound of the wings was then begun (Figure 10, E). Likewise, the descent may not always be direct. Male C was observed to circle over the trees and shrubs to the west and south of his territory before alighting. Pettingill (1936:284) observed a male begin the first song-flight of an evening from his feeding area and end it on the display territory.

Males may leave the display territory immediately after descent without alighting; they may leave after alighting without calling; or they may remain on the territory for a short period (2 to 6 minutes, Table 1), during which calling continues, but subsides more or less sharply (from 14 to 2 calls per minute). Brewster (1894:297) and Pettingill (1936:300) report similar observations, although the post-display calling reported by the latter author continued for 8 to 20 minutes. On March 31, a moon-lit night, the sound of flight was heard, from the territory of male B, 8 and 10 minutes after calling ended; but during several hours' wait, no further activity was noted.

Song-flights vary in length among different individuals as well as in a single individual (Table 4). The songs generally do not exceed one minute in length. In my observations 60 seconds was maximum, in those of Pettingill (1936:291), 66 seconds. My observations on height of song-flights (Figure 10, B) agree in all essentials with those of Pettingill (1936:291).

The chief function of the display flight appears to be territorial advertisement, and, whereas the cackle note serves as a threat, the song-flight may at times function as a superlative threat behavior in

TABLE 4

DURATION OF SONG-FLIGHTS

	Date	Number of Performances	Average Length	Extremes
Male A	March 14	11	34 sec.	29–40 sec.
	21	7	43	40–45
	27	8	40.5	37–44
	28	5	41	40–42
Male B	March 13	6	54	45–60
	27	3	46	45–48
Male C	March 22	4	52.5	50–55
	24	3	49	43–55

the face of a need for stronger offense. To cite some illustrative observations: On March 20, male A flew toward an intruder, giving the cackle note as he approached. (The lower pitched *peents* of the intruder suggested it to be a female.) A few seconds after alighting near the intruder, the male performed a flight display. On March 22, male C flew toward an intruder without alighting and returned immediately to his calling ground, where he started a song-flight. On the same date, male C flew toward the area of a neighbor to the south, giving the threat note, and then continued into a song-flight (Figure 10, E). And, finally, in beginning his ascent, male C, circling widely above the territory of a calling neighbor (S_1), would interrupt the steady whirr of his wings with the threat note just above the other bird (Figure 10, F). Similarly, male A uttered the threat note during his ascent, as male B called from his territory (March 27).

A difference between *Philohela minor* and *Scolopax rusticola* worth noting at this time is that in details of the song-flight. The male of *Philohela minor* displays over a rather circumscribed area, separate from his feeding area. The male of *Scolopax rusticola* displays over a comparatively large area, which apparently includes his feeding sites; he seems to follow the bounds of selected territories in horizontal flight circuits, from several hundred yards to one or two miles long, over or along the edges of wooded areas, flying back and forth several times during a single crepuscular period (Warwick and van Someren, 1936: 167). A similar horizontal display flight occurs in *Scolopax saturata* (Mayr and Rand, 1937:29).

In the case of *Scolopax,* the area covered by display flights makes study of territorial relations among neighboring males rather difficult, but the flights appear to bear the same significance in territoriality as those of *Philohela.* Witherby *et al.* (1940:187) term them advertisement flights. Warwick and van Someren (1936:171) consider "roding" (as the crepuscular flights are known in Great Britain) to be largely

aggressive and to have the same territorial basis as song has in many passerines. My own opinion on comparable behavior in *Philohela* is in agreement with these views.

"Double" Flights and Female Display.—On March 22, Mr. and Mrs. Speirs had the good fortune to observe two Woodcocks in a peculiar flight over the territory of male B. It appears that the two birds began song-flights simultaneously, ascending about 20 feet apart. The usual whirr of wings was heard during the ascent, but instead of the gradual rise and subsequent pulsation, these two birds merely approached each other repeatedly while mounting to a height comparable with that of normal song-flights. Following this, there was a smooth descent without any chipping or twittering. I can only suggest that these were probably two males who merely chanced to start their flight simultaneously.

There is no satisfactory record for female display in the American Woodcock, and the possibility of a mating flight remains doubtful. Brooks (1935:307) describes a circular flight of two birds together; he suggests that one may have been a female, but admits that the two birds may have been males which happened to begin their flights at the same time. Bagg and Eliot (1937:208) state that "occasionally two birds perform together, facing each other, seeming to climb perpendicularly up the air, each alternately the higher; but whether these are mates, or rival males, and whether both sing, is as yet unknown." According to Zedlitz (1927:76) and Steinfatt (1938:390), the female of the European Woodcock does not display. Warwick and van Someren (1936:170) consider flights of two birds together to be those of male and female, but apparently no attempt was made to settle this point conclusively (see Zedlitz, 1927:77).

Light.—Whereas calling began over an appreciable range of light intensities, singing began consistently when the light fell between 1 and 0.5 foot-candles (Table 5). On the morning of March 24, both

TABLE 5

TIME OF FIRST SONG IN RELATION TO LIGHT

Date	Time	Light Intensity
March 20	6:23 P. M.	1–0.5 foot-candles
21	6:26	0
22	6:24	1–0.5
27	6:34	1–0.5
28	6:36	1–0.5
31	6:43	1–0.5

calling and singing ceased before the light indicator rose above zero. Brewster (1894:293) observed that there was less daylight during the morning singing period as compared with the evening period.

Temperature and Wind.—At least from March 13 through 28 (Figure 8), length of song period, in correspondence with length of calling period, may be correlated with temperature; that is, from day to day, song periods tend to vary in length directly with variations in daily temperature (Pettingill, 1936:296). Song periods varied in length from 21 to 33 minutes (Table 6). After March 27 the dispersal mentioned earlier began, accompanied by a subsidence of singing and calling (Table 1 and Figure 8). The singing periods during this latter part of the study are therefore regarded as subnormal.

TABLE 6

DURATION OF SINGING PERIODS AND FREQUENCY OF SONG-FLIGHTS

	Date	Time	Length of Singing Periods[1]	Number of Song-flights	Average Interval Between Flight Starts
Male A	March 14	6:13–6:40 P. M.	27 min.	16	1.7 min.
	20	6:23–6:46	23	10	2.3
	21	6:26–6:54	28	10	2.8
	27	6:34–7:00	26	16	1.6
	28	6:37–6:58	21	9	2.3
Male B	March 27	6:34–7:00	26	15	1.7
	28	6:36–6:58	22	9	2.4
	31	6:43–6:57	14	5	2.8
Male C	March 21	6:18–6:51 P. M.	33	12	2.7
	24	4:58–5:26 A. M.	28	11	2.5

[1] Measured from first to last song-flight.

Whereas length of singing periods was correlated with temperature, there was no evidence that frequency of song-flights during the singing period (Table 6) was affected by temperature. On the cold evening of March 17, no song-flights were performed. It will be recalled that no effect of temperature on rate of calling was noted except on March 17. Records of three males on various dates show that, at least within the range of available data, the variation in frequency of song-flights is slight. The low figures for March 14 and 27 may be accounted for by exceptional competitive behavior between neighboring males. Among the remaining records, song-flights were begun, on the average, once every 2.3 to 2.8 minutes—a relatively regular rate—irrespective of the length of the singing period.

Wind may have marked effect on the length and general performance of the song-flight (Pettingill, 1936:292, 293). In Figure 10, C, a song-flight performed in strong wind is diagrammed as viewed from the side. Under such conditions, the flights are shortened (see the record of male A for March 14, Table 4). Part 3 of the song-flight was shortened markedly in the face of strong wind, and lasted from 3 to 10 seconds (average 5.5 for 9 records) as against a normal 10 to 15 seconds on calm evenings.

Territorial Behavior

At present, only the display sites are known to be defended. It follows then that neither the feeding areas of the males nor the nesting areas of the females can be called territories. Pettingill (letter) properly points out that it would be unusual for a bird not to show evidence of territoriality in the vicinity of the nest, but no data are available. Woodcocks may be gregarious on feeding grounds in winter and in migration, but it yet remains to be determined whether or not they are gregarious in late spring and summer. Under present-day conditions of reduced abundance, there is limited opportunity to investigate these points. During day-time observations (March 24) on the study area, when at least 12 Woodcocks were found about suitable feeding areas (Figure 3), no intolerance or chasing was seen. In the literature on Scolopacinae, I have found no mention of territorial behavior on feeding or nesting areas.

Extent of Feeding Area and Territory.—The size of the feeding area occupied by the male Woodcock appeared to be determined largely by availability and suitability of foraging sites. The area over which a bird forages may vary to a considerable degree (Pettingill, 1936:283). The birds believed to be occupants of areas *a*, *b*, and *c* (Figure 5) were seen regularly at favored feeding sites within parts of their respective areas. The feeding areas of these birds were between 250 and 300 feet in diameter and larger than examples mentioned by Pettingill. But I attribute this to the greater extent of suitable feeding grounds in my study area. At the time of observation, scattered spring ponds and moist, soft, leaf-littered woodland floor provided excellent sites for them. Areas *a* and *c* were both surrounded by additional ground over which feeding might have occurred. I would suggest that these feeding areas were probably maximal in extent.

Calling sites on the display territory were confined to areas relatively small, and more or less circular, ranging from 50 to 75 feet in diameter. Areas of about equal extent are described by Pettingill (1936:284) and Aldous (1938:840). Depending apparently on the presence of shrubby masses over the display territory, there may be what Norris *et al.* (1940:9) term a "primary singing ground" together with one or more "auxiliary" areas. This agrees in essence with my observations of singing-grounds with scattered shrubs and without clear-cut openings, where a male might call usually from one favored site, but would move occasionally to another site as much as 75 feet away. The areas described by Norris *et al.* (average 21x37 feet) probably were small chiefly because of this vegetational factor. Brewster (1925:230; 1937:166) observed males singing and alighting at different points in fields of several acres instead of maintaining more or less definite stations.

My observations on the extent of the area covered by one song-flight differ from those of most earlier reports. Most flights, the ascents of which were more or less circular, were spread over areas of only 35- to 40-yard diameter (⅓ acre). Certain irregular flights of male C extended over as much as ⅔ of an acre; moreover, male C consistently flew over larger areas than males A or B. He also was the most belligerent and held the largest territory. Further, the placement of the calling site in relation to large vegetational masses was such that his ascent could not be made over a circle about a beginning point, and this largely accounted for the irregularities in his song-flights (see Figure 10, E). Other factors, for instance the proximity of competing males, may influence the spatial extent, as well as the vigor, of the flight-song. Pettingill (letter) states that the total area covered by a song-flight seldom, if ever, exceeds 300 feet square (about two acres).[3] This figure was calculated to include flights begun or ended outside the display territory and flights performed in strong wind. Brooks (1935: 308) reports circles of as much as 400 yards in diameter. Such circles would be over 2½ acres in size! Brewster's estimate (1894:293) that a flight may extend over five acres likewise seems to be excessive.

However, the display flights do not always cover the same area. On different flights, males may fly in different directions so that the total area covered by all flights of one male may reach two to five acres (Figure 5). A male asserts his claims in any part of the area generally covered by his song-flights in spite of the fact that calling is usually confined to the center of the area.

Relations of Neighboring Males.—Several references have already been made to the territorial behavior displayed among neighboring Woodcocks; namely, (1) chasing of intruders, (2) preliminary flights over territories, and (3) warning and threat notes. In addition, chases occurred among closely neighboring birds one of whom would leave his own area, invade that of a neighbor, and chase or attempt to chase him away, indicating overlap of areas claimed by individual males. On March 21 and 22, male C chased and probably attacked at least three neighboring males (Figure 5); the third male, present only on March 22, called from the open area along the south border of C's territory, west of the road. There were numerous other instances, involving males A and B also, when fewer birds were present. Retaliatory chases were also noted. Male C assaulted and probably chased at least twice a close neighbor to the south. He was apparently successful in driving him off, for following the encounters, the south bird began a song-flight and ascended over the territory of male C, then continued to the north in a direct flight, and did not return.

Competition between males A and B was noted several times. On

[3] In Pettingill's monograph, the statement concerning area covered by a song-flight (1936:291) should read 300 *feet* square instead of 300 *yards* square. In a letter, he suggests that this correction be recorded here.

March 21, for instance, male A was observed to display again almost immediately after descent if male B was in display at that time. On March 27, male A displayed six times, and male B five times, within the same period of six minutes. Similarly, on March 28, males A and B gave five overlapping performances (three by male B) within a period of three minutes. Another demonstration of competitive behavior was seen in the directions of the respective ascents of males A and B, as shown in Figure 10, D, again suggesting overlap of territorial areas desired by each male. This feature of the song-flights of the two neighboring males was observed repeatedly when both were performing.

Pettingill (1936:282) observed an established bird fly over to the calling site of a second bird and there begin a song-flight. He saw no combat between one male and two others which were established within 300 yards of the first, but I found males fighting and actively competing when they were 500 feet apart (Figure 5). Aldous (1938:840) observed the shortest distance between two singing grounds to be 400 feet; this apparently refers to the boundaries, so that occupant males were probably farther apart. He makes no mention of any competitive behavior.

Strutting and Mating

While calling, the male maintained a stiff stance with head pulled back, wings dropped, and tail spread and held vertically (see also Pettingill, 1936:294). When uttering the *peent* note he jerked his head backward. Usually, the calls were given from one position, which was then changed by a few steps. But on two occasions I saw a rhythmic strutting (by male C, March 22). Tail, wings, and head were held as described above. The bird moved stiffly along a straight line for about two feet, then turned about 120° to the left, giving a *peent* note at the end of the turn. The original direction of movement was then resumed, and at the end of another two feet, another turn was made. This performance was repeated several times.

This behavior appears to be only a manifestation of excitement during the display period. Female Woodcocks strut similarly when disturbed from the nest (Ford, 1926; Murphy, 1926), and I would regard this behavior (wings dropped, tail spread, etc.) as comparable with that seen in individuals of a variety of species when excited. It is not necessarily a courtship display—the behavior preliminary to mating may be distinctly different, as described by Norris *et al.* (1940:10). But it is possible that strutting may occur just prior to copulation: Pulchaski (see Steinfatt, 1938:410) reports a displaying male *Scolopax rusticola* that alighted near a nest which contained an incomplete clutch; the female left the nest and strutted, then crouched; copulation followed.

What can be said of the relation of mating to the display territory? The established male appears to resent all intruders and assaults them

with the cackle note. Females may visit the singing-field (Pettingill, 1936:284), but visiting birds may include males as well, both established (as competing neighbors) or unestablished (as transients or new arrivals on breeding grounds). Several authors insist on interpreting chases as occurring between male and female. The events subsequent to any territorial intrusion are determined largely by the responses of the outsider to intimidation. On several occasions, I have seen the male approach an intruder and then either display in a song-flight or chase the intruder—a chase if the latter leaves, or a display if the intruder stays his ground. Norris *et al.* (1940:10) suggest that copulation is attempted if the intruding bird remains quiet. They observed that a decoy of male proportions placed in normal standing position on a territory, if seen by the established male, was received sooner or later as a female, and copulation was attempted. Here the important point is that an intruder remaining quiet on the singing grounds of a male is accepted by him as a receptive female. Under these circumstances, the male assumed a peculiar stance, first described by Norris *et al.* With wings raised and legs stiffened, the male approached the decoy, dropping his wings occasionally and uttering only the *took-oo* notes. Treading occurred from both sides as well as from behind. Any conclusions drawn from these observations must remain tentative, however, until full data on behavior before and after natural copulation are available.

An observation of mating in the European Woodcock has been mentioned above. The only report of copulation in the American Woodcock is that of Shelley (Pettingill, 1936:305); this record apparently was also made on the display territory. I did not observe copulation. From our limited information, it appears that mating may occur either on display grounds or near nesting sites, but initial matings of a breeding season probably occur on the display grounds. The question arises: does one male establish a pairing bond with a female during the egg-laying period and later visit the site of the nest? Or does the occurrence of mating near the nest result from a chance discovery of a receptive female by a male moving about favorable feeding grounds?

Pettingill (1936:306) and Norris *et al.* (1940:9) consider the Woodcock to be polygamous, but the available evidence is not satisfactory. Circumstantial evidence drawn from my observations agrees with that cited by Pettingill (1936:305): more than one bird may enter the display territory and apparently remain for a time; likewise, on diurnal feeding areas, several birds may be present (Figure 3). Pair formation does not occur in the European Woodcock (Steinfatt, 1938: 387), and the species is regarded as polygamous (Zedlitz, 1925:67). Zedlitz (1927:75) reports females of *Scolopax rusticola* to be polyandrous in areas where males are numerous. The studies of Steinfatt and

Zedlitz suggest that several copulations are necessary for the completion of a clutch. Considering the comparable breeding biology of *Philohela* and *Scolopax,* it is possible that these conditions obtain in *Philohela,* also. On the other hand, Aldous (1938:842) regards the species as monogamous. Certain observations by Brewster (1925:228, 229) favor this contention.

Display in Relation to Migration and Nesting

Woodcocks did not remain to nest on the study area in 1939, and from the foregoing discussion, it is evident that American Woodcocks may, during passage northward, become established temporarily and exhibit territoriality. According to data sent to me by J. Murray Speirs, performing males were present in Champaign County in 1940 at least from March 19 to April 2, but departed; in the spring of 1941, although several observers looked for Woodcocks, none was found.

Data from other parts of the northeastern United States, presented below, show that flight displays of the Woodcock are normally given for approximately two months beyond the latest record from Champaign County. Most breeding records fall in April. There seems to be little doubt that the birds which left the study area became re-established elsewhere.

Territorial behavior, then, may not necessarily be restricted to sites where actual breeding will take place. Studholme and Norris (1942:231) report migratory movements of Woodcocks and variations in numbers of singing males during the first week of April in central Pennsylvania; after the first week, numbers were more or less stabilized, and territories were definitely established. Steinfatt (1938:384, 386) observed that males of *Scolopax rusticola* performed their crepuscular flights when stopping in the course of spring migration. It may be added that flight displays of the American Woodcock have been observed at the time of fall migration (Pettingill, 1936:303).

In east-central Illinois, as in most other parts of the state, the Woodcock generally arrives in spring during the first half of March (Pettingill, 1936:233). The earliest arrival date at Urbana is March 5. The species may be fairly common locally during migration, but as a summer resident it is uncommon. Available nesting records show that eggs are laid from late March through April (Hess, 1910:31 and 1912, MS). Nesting records from northeastern states generally range from late March through May, however, and at any particular location the breeding season may be irregular because of the relatively long time span during which nesting may take place (Brooks, 1930:249). Yet there is no satisfactory evidence that the American Woodcock generally nests more than once a year. Two nestings may take place on occasion, as suggested by records of Pettingill (1936:218), Hicks (1933:181), and Bagg and Eliot (1937:208). The European Woodcock regularly breeds twice a year (Steinfatt, 1938:390).

In east-central Illinois, display flights have been observed from March 9 through April 2. Records over a series of years, however, would probably extend this period. In northwestern Ohio, for example, records of males in flight displays extend from February 28 through May 10 (Trautman, 1940:249); in the Cayuga Lake basin, New York, from March 14 to June 2 (Pettingill, 1936:277, 297); and on Long Island, New York, from February 13 to May 28 (J. T. Nichols, letter). Bagg and Eliot (1937:208) record males in the Connecticut Valley, Massachusetts, giving crepuscular calls on February 5 and 24; dates on which flight displays were seen range from March 4 to June 7. One late date, July 17, 1933, is also given. Studholme and Norris (1942:233) found that most males ceased regular display by the middle of May, although irregular display continued until June 3. Their observations indicate that there is only one cycle of active display among the established males of an area. In the European Woodcock, there are two cycles of active flight display corresponding to the two broods per nesting season (Steinfatt, 1938:384): the "Frühlingsbalz," in East Prussia, lasts from late March through April and the "Sommerbalz" lasts from early May through most of June, or even until as late as July 12.

In making this study of the American Woodcock, I attempted primarily to investigate certain features of territorial relations left unsettled by earlier studies. Unlike Pettingill's experience (1936:283), I found evidence for (1) competition in selection and maintenance of a display territory, (2) combat, (3) overlap of territories, (4) leaving of territories to fight neighbors, and (5) increased vigor of singing among neighboring males. However, these points need to be amplified through further observation and study. My own field work was limited by lack of time. There is obviously a great deal yet to be learned about the American Woodcock, and several questions must be apparent to the reader. Among these are the problems of polygamy, pair-formation, and territoriality on areas other than display sites. Investigators may gain some idea of the data needed for the American Woodcock by reading the excellent summarization by Witherby *et al.* (1940:184) of available data on the European species.

Summary

During the early spring of 1939, a study of territoriality, display, and certain ecological relations of the American Woodcock was undertaken at Urbana, Champaign County, Illinois. From a small concentration of migrant Woodcocks present on the semi-wooded study area from March 5 to April 3, three established males were studied. They were confined to more or less definite feeding areas and to open-country, crepuscular-display territories.

A call-note of advertisement and warning, *peent*, is given repeat-

edly on the display territory when the occupant male is not performing a song-flight. Competition among neighboring males accelerates rate of calling. Normal, day-to-day variations in temperature do not appear to affect rate of calling. But the length of the crepuscular calling period tends to correlate directly with temperature variations; that is, calling periods are longer when daily temperatures are higher. There is undoubtedly a relation between light intensity and beginning and ending of crepuscular calling, but other factors complicate this relation.

The cackle note is given by an established male in assault and threat toward other birds who invade his territory or who occupy neighboring territories.

The song-flights of the male Woodcock function chiefly in territorial advertisement but may also function in intimidation. Neighboring males may compete through more frequent performance of the song-flight. The frequency with which the song-flight is performed does not appear to be affected by temperature. First song-flights were given during evening display periods when the light intensity fell to 1.0 to 0.5 foot-candles. Length of singing period as well as length of calling period tends to vary according to day-to-day temperature fluctuations.

Only the display sites of males are known to be defended, and at present only these can be termed territories. Manifestations of territoriality among established males are seen in competitive selection and maintenance of singing-fields, combat, overlap of display territories, efforts to displace neighbors through aggression, and increased vigor of singing and calling among closely neighboring males.

Feeding areas occupied by three males were 250 to 300 feet in diameter. Calling sites ranged from 50 to 75 feet in diameter, but territorial claims are asserted over larger areas, defined in part by outer limits of display flights. Single flights may cover areas of ⅓ to ⅔ of an acre. All flights of a single male may cover a total area of two to five acres.

Both male and female Woodcocks may strut when excited. Strutting is not necessarily a courtship display preliminary to mating.

Territorial males resent all intruders and assault them with the cackle note. Events subsequent to any intrusion are determined largely by responses of the intruder to intimidation.

American Woodcocks may become temporarily established on territories during the period of spring migration.

Literature Cited

Aldous, Clarence M.
1938 Woodcock-management studies in Maine, 1937. *Trans. 3rd North American Wildlife Conference,* 1938:839-46.

Bagg, A. C., and S. A. Eliot, Jr.
1937 Birds of the Connecticut Valley in Massachusetts. Hampshire Bookshop, Northampton, Mass.

BREWSTER, WILLIAM
1894 Notes and song-flight of the Woodcock. *Auk*, 11:291-98.
1925 The birds of the Lake Umbagog region of Maine. Part 2. *Bull. Mus. Comp. Zool.*, 66:211–402.
1937 Concord River. Harvard Univ. Press, Cambridge, Mass.

BROOKS, MAURICE G.
1930 Notes on the American Woodcock in central West Virginia. *Auk*, 47:248-49.
1935 Does the female Woodcock ever sky dance? *Auk*, 52:307–8.

FORD, EDWARD R.
1926 The Woodcock's display. *Bird-Lore*, 28:395.

HESS, ISAAC E.
1910 One hundred breeding birds of an Illinois ten-mile radius. *Auk*, 27: 19-32.

HICKS, LAWRENCE E.
1933 The breeding birds of Ashtabula County, Ohio. *Wilson Bull.*, 45: 168-95.

LINSDALE, JEAN M.
1936 Opinions aroused by Pettingill's monograph on the American Woodcock. *Condor*, 38:250-51.

MAYR, E., and A. L. RAND
1937 Results of the Archbold Expeditions, 14. Birds of the 1933-1934 Papuan Expedition. *Bull. Amer. Mus. Nat. Hist.*, 73:1-248.

MEROVKA, LAWRENCE J.
1939 The Woodcock in Louisiana. *La. Cons. Rev.*, 8:11-14.

MURPHY, ROBERT CUSHMAN
1926 Nest-protecting display of the Woodcock. *Bird-Lore*, 28:265-66.

NICE, MARGARET MORSE
1941 The role of territory in bird life. *Amer. Midl. Nat.*, 26:441–87.

NORRIS, RUSSELL T., JOHN D. BEULE, and ALLAN T. STUDHOLME
1940 Banding Woodcocks on Pennsylvania singing grounds. *Jour. Wildlife Management*, 4:8-14.

PETTINGILL, OLIN SEWALL, JR.
1936 The American Woodcock, *Philohela minor* (Gmelin). *Mem. Boston Soc. Nat. Hist.*, 9, No. 2:167-391.

STEINFATT, OTTO
1938 Das Brutleben der Waldschnepfe. *Jour. für Ornith.*, 86:379-424.

STUDHOLME, ALLAN T., and RUSSELL T. NORRIS
1942 Breeding Woodcock populations. *Auk*, 59:229-33.

TRAUTMAN, MILTON B.
1940 The birds of Buckeye Lake, Ohio. *Misc. Publ., Mus. Zool., Univ. Mich.*, No. 44:1–466.

WARWICK, T., and V. D. VAN SOMEREN
1936 The roding of the Woodcock (*Scolopax rusticola rusticola* Linne). *Scot. Nat.* (Edinburgh), No. 222:165-72.

WITHERBY, H. F., F. C. R. JOURDAIN, N. F. TICEHURST, and B. W. TUCKER
1940 The handbook of British birds. Vol. 4, Witherby, London.

ZEDLITZ, O.
1925 Aus der Kinderstube schwedischer Brutvögel. 4. Die Waldschnepfe (*Scolopax rusticola rusticola* L.). *Beiträge zur Fortpflanzungsbiologie der Vögel*, 1:65-67.
1927 Contributions a l'étude biologique de la Bécasse. *Rev. Française d'Ornithologie*, 2nd ser., No. 214:74-81.

UNIVERSITY OF CALIFORNIA, BERKELEY, CALIFORNIA

NIDIFICATION OF THE PASSERINE BIRDS OF HISPANIOLA

BY JAMES BOND

WHEN I began my survey of the avifauna of the West Indies in 1927 very little was known of the nesting habits of the birds of Hispaniola, and I tried to fill this gap during the nine months that I spent on the island. It seemed especially important to secure information on the nesting of the endemic species, all of which I encountered in the field and most of which I collected. It must not be forgotten that the instinct to construct a particular type of nest is inherited, just as structural and color characters are; and although rarely mentioned by systematists, the type of nest is, I believe, frequently more indicative of relationships than anatomical characters are.

This paper deals only with the Passeriformes, not only because birds of this order are the least known, but also because their nesting habits (with a few exceptions) are of greater taxonomic significance. For example, the nidification of the continental *Schiffornis turdinus* indicates that this peculiar species is a member of the suborder Mesomyodi and should probably be referred to the Cotingidae. Griscom (1932:277) writes that "the characters which make it a member of the Mesomyodi are only assumed" and that "in life *Schiffornis* is thrush-like in habits and appearance." But no thrush that I know of builds a nest or has eggs resembling those of *Schiffornis*. Again, nests and eggs of the peculiar family Pteroptochidae suggest relationships with the New Zealand "wrens" (*Xenicus*, etc). As an example among non-Passerine families, I believe that a comparative study of nidification of the swifts will prove particularly helpful to systematists.

After examination of hundreds of nests of West Indian birds from all parts of the region, I have reached the following conclusions:

(a) Quite distinct or at least not strictly representative species of the same genus usually build distinctive nests (e.g. *Elaenia martinica, E. flavogaster, E. fallax*).

(b) Representative species and subspecies build similar types of nests, and the eggs are usually similar. There is more individual than subspecific variation in nest construction.

(c) In the West Indies many of the rarer passerine species lay not more than two eggs, the common species seldom less but rarely more than three. In the Greater Antilles, certain genera (e.g. *Myiarchus, Corvus*) frequently, if not habitually, lay four eggs.

(d) In southern Haiti the breeding season of most of the rarer passerine birds is toward the end of the first rainy season (May and June), and but one brood is raised annually. The season is not nearly so definite with the commoner species, some of which (e.g. *Coereba,*

Tiaris) may be found nesting at any season of the year, and they probably rear two broods. Birds apparently nest earlier in northern Haiti than in the south.

Annotated List *

Gray Kingbird, *Tyrannus dominicensis dominicensis*

The Gray Kingbird habitually lays three eggs in Hispaniola. A few nests were found with one or two eggs, but these were probably incomplete or may have represented a second laying. Nests found from April 18 to June 1.

Loggerhead Flycatcher, *Tolmarchus caudifasciatus gabbii*

This flycatcher builds a flimsy, cup-shaped nest like that of the Gray Kingbird. One nest, which I found near Kenscoff, contained two heavily incubated eggs, which were unfortunately broken when an attempt was made to collect them. Mr. George Smooker of Trinidad has a set of three eggs that was taken in Haiti by Dr. J. G. Myers, formerly of the Imperial College of Tropical Agriculture in Trinidad. These eggs he describes (in a letter) as follows: "ground a medium cream color; upper markings umber-brown of rather varying shades, splashed and scattered irregularly over the surface of the shell, but more pronounced at the larger end where a very few black hair lines and dots are apparent; underlying markings lavender-grey, not profuse (23.5 x 17.5; 24.6 x 18.2; 24 x 18 mm.)."

The nidification of *Tolmarchus* indicates close relationship with *Tyrannus* but not with *Pitangus* (*sulphuratus*) which builds a large, untidy globular structure with the entrance near the top (Belcher and Smooker, 1937:234). In the latest review of the Tyrannidae (Hellmayr, 1927) the genus *Tolmarchus* is far removed from *Tyrannus,* being placed next to *Pitangus.* From a morphological viewpoint alone, the relationship of *Tolmarchus* with *Tyrannus* seems to me at once apparent. The bill, particularly that of the Bahaman race (*bahamensis*), resembles that of *T. melancholicus.* The color pattern of *Tolmarchus,* especially the dark pileum and whitish tip of the tail, reminds one of our Eastern Kingbird (*T. tyrannus*). Incidentally, its rather harsh chattering notes are also reminiscent of this well known species. Nests found from May 14 to July 12.

Stolid Flycatcher, *Myiarchus stolidus dominicensis*

The nidification of the Stolid Flycatcher resembles that of others of the genus. Nests found in Hispaniola and on Gonave Island were placed in cavities in trees or cacti. One nest contained shed snake skin, a material often found in nests of the northern *M. crinitus,* and also

* Description of nests and eggs are supplementary to those given in Wetmore and Swales (1931) and in Bond (1936). Precise nesting dates pertain to nests, found in Hispaniola or on Gonave Island, that contained eggs unless otherwise stated.

noted in nests of *M. tyrannulus,* although not in those of *M. validus* and *M. barbirostris,* both of Jamaica, probably because snakes are almost extinct in Jamaica, where I saw only one snake (*Epicrates subflavus* Stejneger), which had been caught by a native near Morant Bay. Eggs (3 to 4) of the Stolid Flycatcher are strikingly marked. Except that they are, of course, decidedly smaller, they are like those of *M.* (*Hylonax*) *validus.* Nests of *Myiarchus* likewise resemble those of *M.* (*Hylonax*) *validus.*

In Haiti I have found *M. stolidus* nesting at an altitude of about 5,000 feet. The Jamaican race (*M. s. stolidus*) is, however, confined to the lowlands, being replaced in the mountains by *M. validus.* Nests found from May 9 to May 31.

Greater Antillean Pewee, *Contopus caribaeus hispaniolensis*

The West Indian pewees are usually placed in the genus *Blacicus,* but I am of the opinion that they should be included in the more widespread *Contopus.* They have been placed by systematists next to *Myiarchus,* but the nidification does not indicate close relationship.

Nests and eggs of the pewee from Hispaniola resemble those of the common Wood Pewee (*C. virens*) of eastern North America. The nests are saddled on the limbs of trees or bushes, often within reach of the ground. The eggs (2 to 3) are frequently heavily wreathed about the middle or widest part, a characteristic of those of *C. virens.* Nests found from May 28 to June 12.

Greater Antillean Elaenia, *Elaenia fallax cherriei*

The nidification of this flycatcher indicates conspecific relationship with the Jamaican *fallax.* The nests are bulky cups of moss, heavily lined with feathers, and are very different from those of either *E. martinica* or *E. flavogaster.* As far as known, both forms of *fallax* lay but two eggs. A single egg from Haiti measures 18.8 x 14.5 mm. Nests found in Haiti were situated from about 6 to 30 feet above the ground. Known breeding dates: May 12 (hatching) to June 4 (laying).

Eggs of the West Indian *Elaeniae* resemble those of *Empidonax,* a genus now placed in a different subfamily (*Myiarchinae*). And the Caribbean *Elaenia* (*E. martinica*) reminded me in the field of the Alder Flycatcher (*Empidonax traillii*), its song and call-note being much like those of this well known species.

Antillean Cliff Swallow, *Petrochelidon fulva fulva*

For an account of the nesting habits of *P. f. fulva* in Hispaniola see Wetmore and Swales (1931:319). This swallow lays two or three eggs.

As far as I am aware the only swallows in North or Middle America that build nests of mud and lay spotted eggs are those of the genera *Hirundo* and *Petrochelidon,* which are evidently related and

probably of Old World origin, although they are not placed together by Hellmayr (1935). Incidentally, it seems to me clear that if the South American swallow known as *Petrochelidon andecola* should prove to build a mud nest and to lay spotted eggs its inclusion in the genus *Petrochelidon* is correct. If, on the other hand, the nidification of this bird should prove to be like that of other American swallows it would indicate that it should be referred to the genus *Haplochelidon,* proposed for this species by Todd in 1929. Nests found from April 24 to July 6.

Golden Swallow, *Lamprochelidon euchrysea*

The nesting habits of the Hispaniolan Golden Swallow (*L. e. sclateri*) resemble those of *Iridoprocne* and *Callichelidon.* Some nests are built under the eaves of houses (at Furcy and at Kenscoff), others in tree cavities such as old woodpecker holes. Three white eggs are laid. Breeding dates: June 6 (egg and young) to June 12 (young).

Purple Martin, *Progne subis dominicensis*

This martin has been found nesting in Hispaniola in old woodpecker holes and under the eaves of houses, but eggs have not been collected on the island. Nests found from March to June.

White-necked Crow, *Corvus leucognaphalus leucognaphalus*

I found a nest of this crow near Bois Laurence on May 2. It was placed in a crotch of a pine which I could not climb. The eggs (3 to 4) were taken by Gundlach in Puerto Rico. They resemble those of other crows.

Palm Crow, *Corvus palmarum palmarum*

Nests and eggs of this locally abundant bird resemble those of other crows. Its eggs (4) are, of course, smaller than those of *C. leucognaphalus.* Nests found from April 24 to May 21.

Northern Mockingbird, *Mimus polyglottos orpheus*

The North and Middle American (including West Indian) genera of Mimidae lay immaculate greenish blue eggs, the exceptions, as far as known, being *Mimus, Nesomimus, Oreoscoptes* and *Toxostoma* (except *T. crissale*). In regard to eggs of *Toxostoma,* Oates (1905:86) states that, starting with *T. rufus* of the eastern United States, birds of this genus lay eggs that become progressively bluer as we proceed westward, the series culminating in the immaculate greenish blue egg of *T. crissale.* Eggs of the Mexican species (*T. guttatum* and *T. ocellatum*) have not been described.

The systematic arrangement of this family might well be modified by reference to nidification. Thus *Dumetella* would not be inserted between *Mimus* and *Toxostoma,* as was done in the 1931 A.O.U. Checklist, but would be placed next to the Mexican *Melanoptila.*

The Northern Mockingbird lays three or four eggs in Hispaniola. Nests found from March to July.

Pearly-eyed Thrasher, *Margarops fuscatus fuscatus*

Not definitely recorded from the mainland of Hispaniola, although known to inhabit Beata Island, off the south coast of the Dominican Republic. Nests have been found on other islands of the West Indies.

La Selle Thrush, *Turdus swalesi*

Nests of the La Selle Thrush are placed in bushes at low or moderate elevations above the ground. They are bulky cups of grasses, covered externally with moss so that they appear, until taken apart, to be constructed entirely of the latter material. The eggs are "robin's-egg blue," rather evenly spotted with greyish brown and lavender-grey. They are characteristic of *Turdus,* and are quite different from those of *Mimocichla.* Incidentally, *T. aurantius* of Jamaica, believed to be the nearest relative of *T. swalesi,* lays eggs strikingly similar to the putty-colored examples (see below) of *Mimocichla.* Nests found from May 20 (a deserted nest) to June 9 (nest under construction).

Red-legged Thrush, *Mimocichla plumbea ardosiacea*

I feel very strongly that *Mimocichla* should be placed next to or near *Turdus,* although Hellmayr (1934) places it far from this genus, with the solitaires (*Myadestes*) in between. The most important generic characters of *Mimocichla,* separating this genus from *Turdus,* are the graduated tail and distinctive color pattern.

Nests found at high elevations in Haiti are constructed of grass and moss, and are virtually indistinguishable from those of the La Selle Thrush, but the eggs (2 to 3) are quite different. They are greenish white, heavily and handsomely marked with dark brown. Strangely enough, eggs from elsewhere in the West Indies have a putty ground color. Nests of the Red-legged Thrush, found at low elevations, are constructed almost entirely of grass. Nests found from May 14 to May 31.

Antillean Solitaire, *Myadestes genibarbis montanus*

The solitaire has not yet been found nesting in Hispaniola. For an account of the nidification of this species in Jamaica and in Dominica see Bond (1936:290, and 1941:373).

Palm Chat, *Dulus dominicus*

For an account of the nesting of this interesting bird see Wetmore and Swales (1931:347). (A life history study of the Palm Chat would be of considerable interest and comparatively simple to make since the species is found abundantly in and near Port-au-Prince and the large communal nests can be located with ease.) Breeds mainly from March to June (Wetmore and Swales, 1931).

Thick-billed Vireo, *Vireo crassirostris tortugae*

In habits, song, and nesting this vireo resembles the North American White-eyed Vireo (*V. griseus*), but the eggs (2 to 3) are generally more heavily marked than those of the northern species. The height of

the breeding season is apparently in March, since I found on Ile La Tortue as many as five nests that contained either eggs or young during the latter part of this month. The species is not known from Hispaniola proper, but is found virtually throughout the Bahama Islands (*V. c. crassirostris*).

Flat-billed Vireo, *Vireo nanus*

The Flat-billed Vireo evidently lays only two eggs, which are nearly, or quite, immaculate. Measurements of one set were 19 x 13.4, and 18.2 x 13.3 mm. Nests found from May 19 (eggs about to hatch) to May 21 (eggs slightly incubated). On March 12 in northern Haiti, near Port de Paix, I secured a male in breeding condition—which would indicate that this vireo nests at an earlier date in this section.

The Flat-billed Vireo is related to and representative of *V. modestus* of Jamaica (Bond, 1934). Both species sing on the nest.

Black-whiskered Vireo, *Vireo altiloquus altiloquus*

Many nests of this vireo were found on Gonave Island in late May. Nests and eggs (3) resemble those of the North American Red-eyed Vireo. Nests found from May 19 (with young) to July 20.

Some time ago the nest and eggs of a vireo, believed to have been *"Vireosylva caymanensis"* (= *Vireo magister caymanensis*), were described by Savage English (1916:28). This is the only species of the *Vireosylva* group other than *V. a. altiloquus* among indigenous West Indian birds. English's record I consider open to question, since he made no mention of *V. crassirostris* and showed his unfamiliarity with the vireos by stating that *"Vireo caymanensis* is very probably the real singer of the song attributed to *Melopyrrha taylori."* However, the nest he described was undoubtedly that of a vireo (probably *V. crassirostris,* since the nest was situated only three feet above the ground). Recently I received from Bonaco Island, Honduras, a nest and egg of *Vireo m. magister,* the only vireo known to inhabit this island. The nest resembles that of *altiloquus,* but the egg, possibly abnormal, is immaculate, except for some minute specks at the larger end.

Bananaquit, *Coereba flaveola bananivora*

The large globular nest of this abundant species is usually placed at a low elevation in bushes or among vines. The nest is utilized not only for breeding but also for roosting (Wetmore and Swales, 1931:364). I have never seen more than three eggs in a clutch. There is no definite breeding time; nests are found virtually throughout the year anywhere in the West Indies. Nests found in the study area from January to July.

Golden Warbler, *Dendroica petechia albicollis*

This Golden Warbler has not yet been found nesting. Nests and eggs that I have examined of other West Indian forms resemble those of northern Yellow Warblers.

Pine Warbler, *Dendroica pinus chrysoleuca*

This common warbler of the pine forests of Hispaniola has not as yet been found nesting on the island.

I have stated (1936:313) that the song of the Pine Warbler is "easily distinguishable" from that of *D. pityophila*. This is indeed true of the North American and Bahaman races, but in the spring of 1941, after visiting the haunts of *D. pityophila* earlier in the year, I heard the song of the Pine Warbler in the forests of La Selle, and I was forcibly struck with its resemblance to that of *D. pityophila*. Known breeding date: May 15 (female with newly formed egg).

Gray-breasted Ground Warbler, *Microligea palustris palustris*

Two nests of this warbler were found on the summit of Morne Tranchant (about 5,900 feet). Both were situated near the ground, one in a very dense bush, the other in a blackberry thicket. The eggs are unlike eggs of *Geothlypis*, believed to be the genus most nearly related to *Microligea*, being more like those of the Cuban warblers of the genus *Teretistris* in having a decidedly greenish background. Though of course much smaller than eggs of *Phaenicophilus*, they resemble them in color. I shot one of the birds on the nest, a most unpleasant thing to have had to do, but essential, since I had previously collected both this species and *M. montana* in this locality, and it was necessary to be absolutely certain of identification. Measurements of a set are 19.5 x 14.7 and 19.7 x 14.8 mm. Nests found from May 31 to June 1.

White-breasted Ground Warbler, *Microligea montana*

The nest and eggs are unknown. It would be interesting to compare them with those of the preceding form, since the two species are not geographically representative of each other. Specimens taken in the Massif de la Selle in early June were in breeding condition.

It is noteworthy that no Antillean warblers are known to nest on the ground as many Central and South American species do.

Antillean Euphonia, *Tanagra musica musica*

This species has been found nesting in St. Lucia (*T. m. flaviſrons*) and in Trinidad (*T. m. intermedia*). The euphonia evidently breeds early in Hispaniola, for in Haiti I collected males with enlarged testes as early as April.

The nidification of *Tanagra* is not characteristic of the Thraupidae. The nests are more or less globular in shape and the eggs finch-like. Some South American species (e.g. *T. laniirostris, T. violacea, Chlorophonia cyanea*) habitually nest on the ground, in the side of a bank.

Hispaniolan Golden Tanager, *Spindalis dominicensis*

Seven nests were found. These were placed in bushes at low or moderate elevations (from 3 to 15 feet) above the ground. They are

composed entirely of dry grasses, are always rather loosely constructed, and are sometimes surprisingly small.

Eggs (2 to 3) of this species vary greatly in color and markings. Those of a set collected measure 23.4 x 16.6, 22.5 x 16.3, and 22.9 x 16.8 mm. Nests found from May 14 to June 10.

Black-crowned Palm Tanager, *Phaenicophilus palmarum*

Nests were found in low bushes three to six feet above the ground, but the majority of individuals undoubtedly build in trees. The nests are deep cups, not unlike those of the Scarlet Tanager (*Piranga olivacea*); they are neater and more strongly built than nests of *Spindalis*. The eggs (2 to 3) show much variation both in color and in size; measurements vary from 23.6 x 17.6 to 27.8 x 18.1 mm.

When examining a nest found on Morne Tranchant, I was astonished at the concern of one of the parent birds, presumably the female, which approached within a few inches of my hand, complaining vociferously, although at the time her eggs were fresh. The species is usually rather shy. Nests found from May 13 to June 8 (nest under construction). A nest, containing three young, that I found near Caracol in northern Haiti on April 28, 1928, almost certainly belonged to this species.

Gray-crowned Palm Tanager, *Phaenicophilus poliocephalus coryi*

I found about 15 occupied nests of this tanager on Gonave Island. They were situated at from 4 to 30 feet above the ground, and they resemble those of *Ph. palmarum*. The eggs (2 to 4) vary considerably in color. As with nests of the Scarlet Tanager, it is sometimes possible to see the eggs from below. Nests found from May 14 to June 26.

Chat Tanager, *Calyptophilus frugivorus tertius*

Although the Chat Tanager is common on Gonave Island (*C. f. abbotti*), no nests were discovered during May and June. The birds did not appear to be in full breeding condition but were found for the most part in pairs. Male Chat Tanagers (*C. f. tertius*) with much enlarged testes were, however, taken in the Massif de la Selle in early June. No certainly authentic nest was discovered, although a single nest, containing one addled egg (23.6 x 18.3 mm.) that I found on Morne Tête-bois-pin (also known as Morne Découverte) near Morne Tranchant, probably pertained to this species. This nest (found June 14) was situated in a fern about two feet above the ground, bordering a blackberry patch. There was a protesting pair of Chat Tanagers a few yards from the nest, so that it is likely that there were young nearby.

I believe that the genus *Calyptophilus* is related to the continental *Rhodinocichla*, the nidification of which is unknown.

Tawny-shouldered Blackbird, *Agelaius humeralis*

No nest of this well known Cuban species has been found in Hispaniola. Known breeding date: July 9 (young out of nest).

Village Weaver, *Ploceus cucullatus cucullatus*

An introduced species, locally common in Haiti. On one occasion, at Basin Generale, I observed over 70 nests in a single tree. For a description of eggs taken in Haiti see Bond (1941*a*:110). Nests found August 4.

Yellow-faced Grassquit, *Tiaris olivacea olivacea*

This finch nests at low elevations in bushes and trees and not infrequently on the ground, either under the side of a bank or in the grass of a roadside pasture. As with many common West Indian birds, nests may be found virtually throughout the year. Danforth (1929:374) recorded one that contained five eggs, in the Dominican Republic, but I have never seen a clutch of more than three of either this or the following species. Known breeding dates: from May (young on wing) to August.

Black-faced Grassquit, *Tiaris bicolor marchii*

This well-known species builds its nest in Hispaniola near the ground, in bushes or ferns or among the spines in the tops of pineapple plants (Christy, 1897:324). In the Bahamas (*T. b. bicolor*) I have found nests in the fronds of palms as much as 20 feet above the ground. Known breeding dates: from May (young on wing) to August.

Greater Antillean Bullfinch, *Loxigilla violacea affinis*

I found 17 nests of this bird in Haiti during May and June, every one of which contained three eggs. Wetmore and Swales (1931:438) report that Abbott received a nest (of *L. v. maurella*) containing six eggs from a native on La Tortue, but I have no doubt that these, as they suggested, represented two separate clutches. I might mention here that I never allow natives to bring me nests and eggs that they have found. I always require that they not only show me the nest *in situ* but also the parent bird on the nest.

Nests found in Haiti were placed either on the ground or as high as 10 feet above the ground, in bushes. Most of the nests were domed, with the entrance at the side, but some had the entrance near the top, and one nest, which contained a full set of eggs (3), was cup-shaped. But the nest is always bulky. It is composed in the mountains very largely of moss; in low arid sections, where moss is not available, of dry grasses. Measurements of a set of eggs of *L. v. affinis* are 20.8 x 16.8, 21.7 x 16.5, and 21 x 16.9 mm. All eggs examined had a very pale bluish-white background (not dull white as in those of the Lesser Antillean *L. noctis*). Nests found: *L. v. affinis*, from May 12 to June 25;

L. v. parishi, May 15; *L. v. maurella,* from March 19 (not "May 19" as stated by Wetmore and Swales, (1931:438) to June 20.

Antillean Goldfinch, *Loximitris dominicensis*

Though all nests that I have found of this species were situated in low bushes or small pines, I think it likely that many are placed high in the pines. They are very neat and compact cups composed entirely of moss. Eggs of one set taken measure 18.5 x 13.7, 18.2 x 13.8, and 18.2 x 13.5 mm. Eggs found from June 2 (eggs heavily incubated) to June 12 (fresh eggs).

White-winged Crossbill, *Loxia leucoptera megaplaga*

A small series that I collected near Morne Cabaio (southeastern Haiti) in June, 1930, had very small gonads. In the Dominican Republic, young that had recently left the nest were collected in March, so it would appear that this crossbill breeds very early in the year.

Grasshopper Sparrow, *Ammodramus savannarum intricatus*

Although nests have been found of both the Jamaican and Puerto Rican races, the nest of the Hispaniola race is still unknown. It is doubtless similar to those of other forms of this well-known species. A young bird in juvenal plumage was taken on February 1 (Wetmore and Swales, 1931:443).

Andean Sparrow, *Zonotrichia capensis antillarum*

No nest with eggs has been found of this race, which is known only from the Dominican Republic. The nest presumably resembles those of other forms of this widespread tropical American species. Female observed gathering nest material May 19 (Wetmore and Swales, 1931:446).

Most West Indian Fringillidae have eggs that are of little value in indicating relationship. A noteworthy exception is the egg of the Antillean Saltator; this is truly distinctive in color and markings, and agrees in these respects with eggs of extralimited species (namely *S. atriceps, S. maximus, S. coerulescens, S. orenocensis* and *S. aurantiirostris*).

Literature Cited

Belcher, Charles, and G. D. Smooker
1937 Birds of the colony of Trinidad and Tobago (Pts. 5 and 6). *Ibis,* 1937: 225–249, 504–550.

Bond, James
1934 The systematic position of *Lawrencia* and *Laletes*. *Proc. Acad. Nat. Sci. Phila.,* 86:399–402.
1936 Birds of the West Indies, Philadelphia.
1941*a* Some West Indian birds' eggs. *Auk,* 58:109.
1941*b* Nidification of the birds of Dominica, B.W.I. *Auk,* 58:364–375.

Christy, Cuthbert
1897 Field-notes on the birds of the island of San Domingo. *Ibis,* 1897: 317–343.

DANFORTH, STUART T.
1929 Notes on the birds of Hispaniola. *Auk*, 46:358–375.
GRISCOM, LUDLOW
1932 Distribution of bird-life in Guatemala. *Bull. Amer. Mus. Nat. Hist.*, 64.
HELLMAYR, CHARLES E.
1927 Catalogue of the birds of the Americas and the adjacent islands. *Field Mus. Nat. Hist.*, 13, Pt. 5.
1934 Same, Pt. 7.
1935 Same, Pt. 8.
OATES, EUGENE W., and SAVILE G. REID
1905 Catalogue of the Collection of birds' eggs in the British Museum, Vol. 4, London.
SAVAGE ENGLISH, T. M.
1916 Notes on some of the birds of Grand Cayman, West Indies. *Ibis*, 1916: 17–35, pl. 1.
WETMORE, ALEXANDER, and BRADSHAW H. SWALES
1931 The birds of Haiti and the Dominican Republic. *U. S. Nat. Mus. Bull.* No. 155.

ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA

JOSEPH GRINNELL'S PHILOSOPHY OF NATURE. SELECTED WRITINGS OF A WESTERN NATURALIST. University of California Press, Berkeley, 1943: 6 x 9¼ in., xv + 237 pp., 2 col. pls., 6 photos., 5 maps and figs. $2.00.

The late Joseph Grinnell's many admirers will be glad to learn that the University of California has brought out in an attractive volume a collection of twenty-eight of his scientific papers. These appeared originally in a variety of publications, and many of them were quite inaccessible to the present generation of natural history students. The papers, which are arranged chronologically, cover the period from 1903 to 1936, and are well chosen to illustrate the work of this great naturalist at its best. The very titles challenge our attention: 'The Museum Conscience,' 'Conserve the Collector,' 'Sequestration Notes,' 'The Principle of Rapid Peering, in Birds.' There are 13 maps, diagrams, and pictures, three of them in color, and an ably written preface by Grinnell's student and successor, Alden H. Miller.

This volume reminds us that Joseph Grinnell was not only an unusually competent and active administrator, teacher, editor, and investigator, but also an original thinker and a clear and forceful writer.—J. Van Tyne.

GENERAL NOTES

Normal Flight of a Black Duck after Healing of Wing Fractures.—On December 5, 1942, while Kenneth H. Doan and I were in a blind on South Bass Island, Lake Erie, Ottawa County, Ohio, a Black Duck (*Anas rubripes*) alighted among our decoys, after first circling them in the wary Black Duck fashion. Its flight appeared normal in every respect. Upon retrieving this duck I noticed that its left wing was decidedly shorter than the right. Dissection revealed that the left humerus had at some time been fractured near the elbow, and in healing, the two segments of the bone had fused at an angle. Thus the humerus was shortened; the proximal segment pierced the skin and protruded at least a quarter of an inch. (Figure 1.) The hollow center of the bone thus exposed had been completely blocked with minute bone fragments, behind which was normal-appearing marrow. The edges of the skin around the exposed tip were entirely healed. At the point of fusion, where the bone was greatly enlarged, there was an arched projection of bone with a hollow center between it and the fracture. An old shot-gun pellet, presumably the one that broke the humerus, was embedded in the muscle beside the point of fracture.

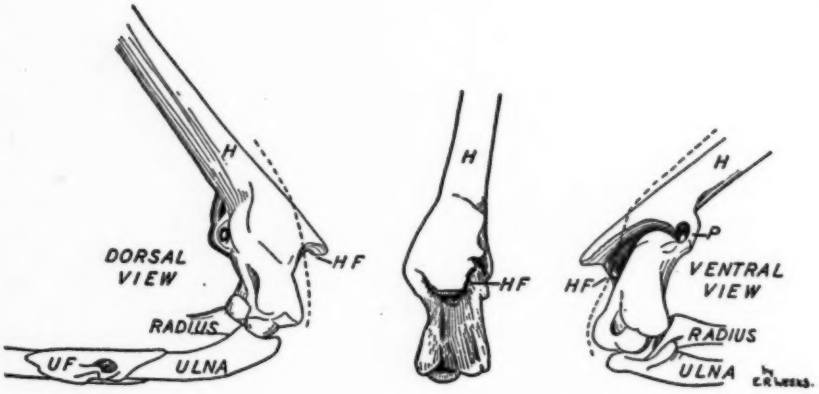


Figure 1. Healed bones of Black Duck wing.
H = humerus; HF = humerus fracture; UF = ulna fracture; P = arched projection of bone; dotted line = skin.

At some time, possibly when the humerus was broken, the ulna had also been fractured, obliquely, near the middle. This fracture had healed, leaving the bone normal in length, although somewhat enlarged at the point of fusion. The muscles and tendons surrounding the humerus and ulna were apparently in excellent condition, but were, of course, distorted because of the abnormal angle of the elbow joint. The fused portions of humerus and ulna appeared to be as strong as the remaining sections of these bones. The duck itself, although not fat, appeared to be in good physical condition. It seems remarkable that so mutilated a wing could function so well that there was no noticeable "limping" in the bird's flight.—MILTON B. TRAUTMAN, *F. T. Stone Laboratory, Ohio State University, Put-in-Bay, Ohio.*

Roseate Spoonbills Transported Northward by Ship.—Chester S. Lawton of the cable division of Western Union has reported to me an interesting case of Roseate Spoonbills (*Ajaia ajaja*) being accidentally transported far north of their normal range.

Captain Bredin Delap and Second Officer W. McGarva report that at sunset on the evening of January 18, 1943, while the cable ship *Cyrus Field* was in the Florida Straits (26° 56′ N., 79° 36′ W.; 25 miles offshore), three Roseate Spoonbills approached the ship from the southwest, circled it once, and flew away to the northeast. The weather was moderate, the wind in the southeast. The next morning at 7:00 A.M. (29° 32′ N., 79° 45′ W.; 67 miles offshore), three Spoonbills, presumably the same individuals, boarded the ship and perched on the lifeboat davits. The weather was then cloudy and squally, the wind in the south. The Spoonbills seemed very tired, and the men tried to feed them, but the birds would not touch food or water. During the day one of the Spoonbills was captured, taken below, and fed. At 5:00 P.M. the two free birds were accidentally frightened from the ship. By that time the wind was strong, and from the northwest. The birds seemed unable to regain the ship and were last seen flying southeast (31° 03′ N., 79° 22′ W.; 95 miles offshore). The third Spoonbill escaped shortly before noon the next day (January 20) in about the latitude of Charleston, South Carolina (32° 42′ N., 76° 47′ W.; 92 miles offshore).

The identification of the Spoonbills is conclusively demonstrated by photographs submitted by Captain Delap. Perhaps similar, but unrecorded, incidents would account for some of those extra-limital records of various species in ornithological literature which are now supposed to represent natural biological distribution.—Josselyn Van Tyne, *University of Michigan Museum of Zoology, Ann Arbor, Michigan.*

The Little Brown Crane in Ohio.—Robert Goslin, of Columbus, Ohio, has recently sent to the National Museum for identification another small lot of bird bones from archeological excavations at the Feurt Village site in Clay Township, Scioto County, southern Ohio, a locality from which many vertebrate remains have been obtained. Among the forms represented I find a complete left humerus collected by Dr. Stanley Copeland, of Columbus, and a nearly complete pelvis secured by H. R. McPherson, of Columbus, that come from the Little Brown Crane (*Grus canadensis canadensis*). The occurrence of this bird in Ohio has previously been open to question. J. W. Aldrich of the Fish and Wildlife Service informs me that the only record he has seen is that of Oliver Davie, who says: "I mounted a specimen of this bird which was taken in the spring of 1884 from a flock of seven birds near Springfield, Ohio. It is a rare migrant in the state." (Nests and Eggs of North American Birds, 1898, page 121.) Aldrich tells me that he has not been able to find that this record had been confirmed by other students, and that it has not been currently accepted.

On comparison with modern skeletons of the Sandhill and Little Brown Cranes, the bones listed above are easily identified by their small size, in which they agree completely with the latter form. They thus make a substantiating record for the occurrence of the Little Brown Crane in Ohio.

From the Feurt excavations there come also three radii that from their large size are obviously the Sandhill Crane. The Indian hunters then, obtained both forms of these birds in this region in the fifteenth or sixteenth centuries. Alexander Wetmore, *U. S. National Museum, Washington, D. C.*

Coots Killed Under Unusual Circumstances.—Although Coots (*Fulica americana*) becoming enmeshed in vegetation and strangling to death is probably only an occasional cause of mortality, the instance which I observed is of interest. While making brood counts and nesting observations on waterfowl in Mud Lake,

near Ruthven, Iowa, July 16, 1939, I found a dead Coot of between six and seven weeks of age suspended by the neck on a piece of reed grass (*Phragmites communis*). The lower one-third of the Coot's body was in the water. Just above and back of the bird was a large platform nest about 24 to 30 inches above the water, built by piling stalks on the base of a smashed clump of reed grass. The bird, using this as a roosting platform, had undoubtedly in jumping off the nest become snared in the loop of reed grass.

Another unusual cause of death among Coots was observed several times during the course of waterfowl investigations in Iowa marshes. On two occasions during the summer of 1939, and once during 1940, I came across Coots hanging from a barbed wire fence which crossed the marshland in Clay County known as Barringer's Slough. Upon closer examination I found that two of these birds had apparently hit the barbs on the wire, which were pointing upward at about 45 degree angles. The barbs tore into the skin of the lower neck, and the birds had swung once completely around the wire, and were thus fastened very securely to it. The other bird had not gone completely around the wire but had caught on a horizontal barb and had fallen over the wire to the side opposite the barb. How long the birds struggled before death overtook them is not known.

On another occasion, several Coots from a flock of about 25 or 30 flying low over the marsh were seen to strike the fence, but none was caught on the barbs. How many birds struck the fence for each one caught is problematical. It is conceivable that injury and death to birds from striking these wires might in a season reach numbers sufficiently large to make justification of the barbed wire across this waterfowl habitat highly questionable.—Jessop B. Low, *Illinois State Natural History Survey, Natural Resources Building, Urbana, Illinois.*

Greater Yellow-legs as a Fish-eater.—Most shore birds generally feed upon insects and other invertebrate life. The Greater Yellow-legs (*Totanus melanoleucus*) is quite adaptable, however, and occasionally an individual is found feeding upon a type of food that may be considered far removed from its normal diet.

On September 3, 1942, at Lac aux Morts (Lake Alice), Ramsey County, North Dakota, I observed a Greater Yellow-legs standing in about 2 inches of water and feeding upon fish. During the short period of 15 minutes that this bird was under observation, it consumed eight small minnows. The bird caught the fish at right angles to its bill, then skillfully turned the fish so that the head was swallowed first.—Clarence Cottam, *Fish and Wildlife Service, Chicago, Illinois.*

Purple Sandpipers at Richmond Beach, Ohio.—About 30 miles east of Cleveland the Grand River empties into Lake Erie at Fairport Harbor. The town of Fairport is on the east, the village of Richmond on the west. A large turning-basin for ore boats has been dredged out at the mouth of the river, and in order to protect this basin from the prevailing currents, which would soon fill it up with sand, a huge stone pier has been built out into Lake Erie for several hundred feet. Since the lake's outlet is to the east of the pier a long sand beach, known as Richmond Beach, has gradually formed to the west. The pier itself is made of large blocks of stone laid without mortar joints, and has many large cracks and crevices. The sides slope downwards to about water level, where the base extends outward on each side for about four feet forming flat stone strips which are covered with algae. On these four-foot strips and on Richmond Beach itself, other observers and I have made a number of records of the Purple Sandpiper (*Arquatella maritima*) since 1937—which are, I believe, the only modern records for this bird in Ohio. They are as follows: one sandpiper seen on December 27, 1937, and one on January 2, 1938 (James Akers); four seen on November 13, 1938 (Mr. and Mrs. M. B. Skaggs, Isabelle Hellwig, and Ralph O'Reilly); two, November 19, 1938 (Mr. and

Mrs. M. B. Skaggs, Vera Carrothers, and Margarette Morse); three, November 20, 1938 (James Akers); one, December 27, 1941 (Arthur Fuller); three, December 31, 1941, and one, November 27, 1942 (Raymond Hill).

I have carefully checked these records with the observers. Skaggs informs me that he and his companions observed the sandpipers with glasses, in good light, at a distance of about 25 feet, and noted the characteristic dark coloration of head and breast, yellow at base of bill, and yellowish-orange legs. The description tallies with Akers' and Fuller's observations and with my own.

On December 31, 1941, I had one of the three sandpipers seen that day under close observation for over an hour, and took 35 feet of 16 mm. colored film, using a three-inch telephoto lens, set at distances of from 12 to 25 feet. I have shown this film to J. Van Tyne and some of his associates at the University of Michigan, who agreed in identifying the movie "specimen" as a Purple Sandpiper.—RAYMOND W. HILL, *3316 Kenmore Road, Shaker Heights, Cleveland, Ohio.*

Glaucous and Great Black-backed Gulls at the Western End of Lake Erie.—While the rest of the lake is still jammed with ice, the thaws and westerly winds of early March commonly bring open water along the shallow western end of Lake Erie. As the shore-fast stacks and sheets of ice slowly disintegrate, flocks of gulls gather to feed on the winter-killed fish in the cracks of the ice and in the muddy pools at the shore.

During the two or three weeks that these conditions usually last, I have seldom failed in the last three years to find at least one Great Black-backed Gull (*Larus marinus*) and (though less frequently) one or two Glaucous Gulls (*Larus hyperboreus*), among the hundreds of Herring Gulls (*Larus argentatus smithsonianus*) and Ring-billed Gulls (*Larus delawarensis*).

These two northern gulls have been considered rare in this region, and though other observers and I made regular sight records, their occurrence in Michigan was not proved by specimens before 1943. Our seeing these birds so regularly during the last three winters, I believe, is only partly explained by the fact that we knew when and where to search. The evidence points to an increase in numbers of both species, especially of the Black-backed. In previous years the Glaucous might have been overlooked frequently, but it seems unlikely that so conspicuous a bird as the Black-backed could have been missed often.

Although similar conditions seem to attract both gulls in their greatest numbers, there are interesting differences in their behavior here. The Black-backed is more regular than the Glaucous; it is the most wary of the gulls seen here; it has never appeared before a freeze-up in Lake Erie, and it is seldom seen after the ice has vanished from the lake; it is rarely seen away from the open lake; birds which look fully mature outnumber immatures 7 to 1. In contrast, the Glaucous may appear at any time from the onset of winter to the end of April; it may be approached at least as easily as a Herring Gull; it has been seen on several occasions along the marshes, estuaries, and rivers near the lake, and on one occasion an individual was seen feeding on skinned muskrat carcasses in a field; individuals vary widely in amounts of buff in the plumage, and every one observed closely enough to discern this character had the dark-tipped mandible instead of the orange-red mark of the fully adult bird.

The Glaucous Gull, which had been observed eight times in seven years, beginning in 1934 (L. W. Campbell, *Birds of Lucas County*), was seen four times in 1941, four in 1942, and four in 1943. Before 1941, no more than one bird was seen on one day, but two were observed on April 13, 1941, and two on March 21, 1942. Although one was seen as early as November 29 (1936), and one as late as June 6 (1937—specimen taken at Little Cedar Point, Ohio, by Campbell), most have appeared between mid-January and mid-April. In all these observations we have eliminated the possibility of confusion with albino Herring Gulls by direct

comparison with individuals of this species present at the same location. Campbell and I took a subadult Glaucous Gull, the first Michigan specimen, at Halfway Creek, Erie Township, Monroe County, February 27, 1943.

The Great Black-backed Gull was first noted in this region on March 3, 1928, and a total of 13 were recorded in 12 years (Campbell). No more than one was seen in a day until January 8, 1939, when two appeared at Little Cedar Point, Lucas County, Ohio. Then, early 1940 brought 4 records and the winter of 1940-41, 9 observations, with a maximum for one day of 5, on January 4 at Erie Beach, Monroe County. In early 1942, 11 were seen, with a peak of 6 on March 15 at Erie Beach. In early 1943, 26 were noted, with the high point on March 7, when 11 were counted in the eight miles of shore between Bolles Harbor and North Cape, Monroe County. The earliest date for Black-backs is December 22 (1940), when two were seen after an unusual thaw had cleared the lake of ice following an earlier freeze-up. The latest—the only April record—is April 18 (1942). I took an adult Black-backed Gull, the first for Michigan, along the beach of Erie Township, Monroe County, March 21, 1943.

This specimen, and the February 27, 1943, specimen of the Glaucous Gull, were placed in the University of Michigan Museum of Zoology.

The observations included in this report were restricted to week-ends. All figures neglect possible duplications between different days, but are corrected for such duplications in any one day. The territory covered fairly regularly extends from Little Cedar Point, Lucas County, Ohio, north about 12 miles airline to Bolles Harbor, Monroe County, Michigan. Between these two extremes it includes several miles of the lower Maumee River and the irregular shoreline of Maumee Bay. Other observers who contributed to these data are William Anderson, Mr. and Mrs. Fred E. Stearns, and John Stophlet, all of Toledo.—HAROLD MAYFIELD, *3311 Parkwood Avenue, Toledo, Ohio.*

The Great Gray Owl as a Predator on Pocket Gophers.—On June 9, 1941, I observed a Great Gray Owl (*Scotiaptex nebulosa nebulosa*) in the Bridger Mountains, about 20 miles northeast of Bozeman, Montana. The locality was in the upper Canadian Zone, at 7,000 feet elevation. The day was cloudy and dark, with occasional spatters of rain. The owl's presence was first given away by the squawking of a Steller's Jay (*Cyanocitta stelleri*), which chased the owl from tree to tree and finally into a stand of dense lodgepole pine and Douglas fir, where the owl was lost to sight.

At 1:15 P.M. I saw the owl in a 25-foot Douglas fir at the edge of a small mountain meadow. Its perch was near the end of a branch about 12 feet from the ground. Within a few minutes the owl made three swoops from this perch, apparently without catching anything. On the fourth swoop it hit the ground with considerable force and in a minute or two flew away with a dead pocket gopher (probably *Thomomys talpoides*) in its talons. An attempt to follow its flight was unsuccessful, and after searching the immediate area for a possible nest I returned to the original meadow. I was astonished to find the same owl, to all appearances, sitting in the same position on the same perch. It again made several swoops, and nine minutes later flew away with another pocket gopher. Fourteen minutes later it was back on the same perch. By 4:30 P.M. the owl had thus caught a total of four gophers and one mouse. The mouse was eaten on the ground where it was caught, but all the gophers were carried away.

The four gophers were caught in the same spot. The first caught was probably heard digging by the owl, which gave every indication of listening to some sound before swooping. Inspection of the spot while the owl was away revealed that the owl had apparently broken through the thin roof of one of the feeding runways of the gopher's burrow. Lack of turf (due to constant tunneling by the gophers in this area) would make such an action easy. The other three were probably caught

as they attempted to plug that break in the tunnel with dirt. Though pocket gophers are chiefly solitary animals, the young gophers are active and still in the parental burrows at this time of year in the Bridger Mountains.

The owl was not wary, but it would fly if I approached to within 40 feet, and then return to the same perch. Apart from this it appeared oblivious of my presence. It seemed to have no difficulty in seeing in the daylight. No sound was made by it at any time.

On July 4, 1941, I again saw a Great Gray Owl flying through an open space in the forest, at 1:00 P.M. when the sun was shining brightly. The location was three miles away from that described above, but in a similar situation. H. B. Mills reports seeing this species in the Bridgers on August 9, 1942, and also in Yellowstone National Park on October 8, 1934. Saunders (*Pac. Coast Avifauna*, 14, 1921:68) reported the Great Gray Owl in Montana as only a winter visitor, but Weydemeyer (*Condor*, 34, 1932:139) reported young on July 4, 1931, from eastern Lincoln County in the northern part of the state. Bent (*U. S. Nat. Mus. Bull.* 170, 1938: 219) has already pointed out that this owl may regularly breed within the limits of the United States. Though no nest has been discovered in the Bridger Mountains it would seem likely that the Great Gray Owl is a permanent resident there.—C. A. TRYON, JR., *Department of Zoology and Entomology, Montana State College, Bozeman, Montana.*

Plague of Mice as Food for Short-eared Owls.—Snyder and Hope (*Wilson Bulletin*, 50, No. 2, 1938:110–12) gave a detailed account of an influx of Short-eared Owls (*Asio flammeus*) into the Toronto region during the late winter of 1935–36 when meadow mice (*Microtus pennsylvanicus*) occurred there in unusually large numbers. After examining 1,078 pellets collected under a roost in that area, they found about 72 per cent of the individuals were meadow mice, and about 27 per cent were deer mice (*Peromyscus* spp.), the remaining 1 per cent being house mice and small birds.

A congregation of Short-eared Owls occurred simultaneously with a high *Microtus* population in central New York during a later winter. Between December 31, 1941, and March 5, 1942, from 2 to 14 Short-eared Owls roosted in a white pine grove near the village of Perry City in Schuyler County, New York. Meadow mice were unusually abundant in this area and formed a large part of the contents of 142 pellets collected under this roost at the end of the winter. Following are the results of the examination of the 142 pellets:

Animals represented	Number	
Microtus pennsylvanicus	124	(82.1%)
Mus musculus	18	(11.9%)
Peromyscus leucopus	5	(3.3%)
Pitymys pinetorum	3	(2.0%)
Blarina brevicauda	1	(0.7%)
	151	

The owls usually emerged from the pine roost at about 3 P.M. each day. As if on a given signal, they would fly out from the pines and start beating back and forth over the adjacent pasture, scanning the snow for mice. On February 9, four Short-eared Owls were seen crossing and recrossing the pasture, while a fifth sat on a nearby fence post with a *Microtus* in one foot. Sometimes they hovered over a particular spot in the snow with a quivering motion of the wings and body; then they would plummet downward with the wings held high overhead and their feet extended as they dropped on the snow. On February 24, 14 owls were flushed from this roost.—PVT. JOHN K. TERRES, *U. S. Army, Peekskill, New York*, and E. W. JAMESON, JR., *Department of Zoology, Cornell University, Ithaca, New York.*

Diving of a Long-billed Marsh Wren.—The "Rice Pond" on Coleraine Plantation, western Charlton County, Georgia, provides one of the best rail and marsh wren habitats in that general region.

On January 16, 1941, Frederick V. Hebard, John W. Burch, and I were listing and collecting birds there. In the middle portion of the pond where the water was knee deep there were thick patches of "maiden cane", the most prevalent plant. Along the edge of a mat of this vegetation a Long-billed Marsh Wren (*Telmatodytes palustris*) was wounded, and Burch and I spared no effort to catch it. In the dark water among the cane stems, this bird deftly eluded our finger tips by *diving*—after the manner of some waterfowl—at each attempted grasp. Considering the time beneath the surface, and the fact that it always emerged very close by, it is highly probable that the wren clutched the bottom growth. More than a minute passed before it was captured. The skin, identified by Harry C. Oberholser of the Cleveland Museum, is referable to typical *palustris*.

This is the first incident I know of diving among the Troglodytidae.—Robert Norris, *1408 North College Avenue, Tifton, Georgia.*

The Alaskan Longspur in Ohio.—On a recent examination of specimens in the U. S. National Museum, I found a specimen of the Alaskan Longspur (*Calcarius lapponicus alascensis*), taken at Columbus, Ohio, February 19, 1875, by Dr. J. M. Wheaton. This bird, a male, has the light edgings of the dorsal feathers extensive, and pale in color, and the concealed chestnut of the hindneck also light in color, both distinctly lighter than in true *lapponicus*. The bird is cataloged as No. 203,070 U.S.N.M. and came to the Museum with the collection of Pierre Louis Jouy. So far as I am aware, this is the first example of this race to be reported from the State of Ohio.—Alexander Wetmore, *U. S. National Museum, Washington, D. C.*

Neglected Sources of Data.—The current preparation of a paper on the food and habits of the Belted Kingfisher has called to my attention an unfortunate situation that I have noticed before. There are, scattered throughout the country, manuscript reports of valuable studies made by workers leaving for service with the armed forces, by candidates for advanced degrees in colleges and universities, or by investigators now deceased. Often an investigator learns only by chance of such studies even when they are in fields closest to his own. It would therefore seem desirable that special effort be made to bring attention to worthwhile material of this kind. Some universities (e. g., Cornell) publish abstracts of doctoral theses, a helpful practice, although many workers obviously fail to consult this source. Another means by which unpublished information (especially theses) may be circulated is through University Microfilms, Ann Arbor, Michigan. This agency, for a nominal fee, not only provides 35 mm. film copy, but also publishes a catalog of items photographed and sends library cards to participating institutions. Such publicity speeds research progress and helps to avoid needless duplication of effort. Two ornithological examples that illustrate the situation follow:

Gould, Victor Eugene. 1934. A monograph of the Belted Kingfisher, *Megaceryle alcyon* (Linnaeus). MS. 309 pp., plus summary, bibliography, and illustrations. (Gould died in 1934 before revising this paper for submission to the Graduate School of Cornell University. A copy of the manuscript is in the hands of Harrison F. Lewis, Chief Migratory Bird Officer, Ottawa, Canada.)

Manuel, Canuto G. 1931. The relation of gulls and terns to the commercial fisheries of Saginaw Bay, Michigan, with particular reference to the Common Tern, *Sterna hirundo* Linnaeus. MS. 180 pp., illustrated. (Doctoral thesis. Copies are in the University of Michigan Library and in the library of Carl L. Hubbs, Museum of Zoology, Ann Arbor, Michigan.)—Karl F. Lagler, *Department of Zoology, University of Michigan, Ann Arbor, Michigan.*

EDITORIAL

We take this occasion to thank Edward A. Mc Ilhenny for his recent generous gift toward the expenses of publication of the *Bulletin*. For more than forty years a member, and for several years a Life Member of the Club, Mr. Mc Ilhenny has long demonstrated his sincere and active interest.

With the hope of making our section on Bibliography more useful, we introduce in this issue a subject classification. The present arrangement is only tentative, and we shall welcome your comments and your suggestions for improving it. Reprints of this section are available at a small cost. Since a number of our members subscribe for these to clip and file in their own bibliographies, the titles from each issue of the *Wilson Bulletin* are now to be included in the bibliographic section of the following issue.

The Club is indebted to Katie Roads, Leslie D. Case, and George M. Sutton for gifts of series of back numbers of the *Bulletin*. There is a steady demand for these, and we are very glad to replenish our stock whenever members find that they have runs or even single numbers which they no longer need.

George B. Thorp and his Endowment Committee report a total of ten new Life Members added in 1942–1943. They ask us to inform the members that any who wish to become Life Members during the year will be allowed credit for 1943 dues already paid.

Ornithological News

Wilfred H. Osgood, Alexander Wetmore, and John T. Zimmer have joined with six outstanding taxonomists in other fields of zoology to form a General Council on Zoological Nomenclature to replace, for at least the duration of the War, the International Commission on Zoological Nomenclature, which can, of course, no longer function. A printed set of by-laws may be obtained from Osgood at Field Museum.

William Vogt, of the Office of the Coordinator of Inter-American Affairs, has been awarded a Guggenheim Fellowship for the preparation of a book on Peru's guano birds, based on three years' study which he recently carried on as naturalist to the Peruvian Guano Administration.

OBITUARY

Leonhard Stejneger, distinguished herpetologist and ornithologist, died in Washington, D. C., on February 28, 1943, at the age of 91. During later years Stejneger devoted himself entirely to herpetology, but between 1871 and 1905 he published many important contributions to ornithology and became an acknowledged authority on the birds of the North Pacific. From 1884 to 1889 he was Assistant Curator of Birds in the United States National Museum.

Althea R. Sherman, well known Iowa ornithologist, died April 16, 1943, at her home in National. She will be especially remembered for her remarkable nesting studies of the Flicker, Screech Owl, Sparrow Hawk, and Chimney Swift. The earliest of these, which were among the first such studies made in this country, were published in 1910 and 1911. Miss Sherman was also a bird artist of real ability, and shared with Louis Agassiz Fuertes the distinction of showing her work in 1919 at the first American Ornithologists' Union exhibit of bird paintings. A member of the Wilson Club since 1902, Miss Sherman was made an Honorary Member in 1929.

WILDLIFE CONSERVATION

Conservation Education

Two recent articles by Aldo Leopold should be read by every member of the Club. Each can be read in a few minutes; each deserves long reflection. The following quotations are but samples, not summaries, and will not spoil the fun of reading the complete articles.

From "Land Use and Democracy" (*Aud. Mag.*, 44, Sept.–Oct., 1942: 259–265):

"Conservation is our attempt to put human ecology on a permanent footing. Milk-and-water education has convinced people that such an attempt should be made, and they have told their government to act for them. Some other force must now persuade them to act for themselves.

"Money-minded people think they are acting when they pay taxes. This hallucination, during the 'defense' period, nearly cost us the war. It will cost us our natural resources if we persist in it.

"To analyze the problem of action, the first thing to grasp is that government, no matter how good, can only do certain things. Government can't raise crops, maintain small scattered structures, administer small scattered areas, or bring to bear on small local matters that combination of solicitude, foresight, and skill which we call husbandry. Husbandry watches no clock, knows no season of cessation, and for the most part is paid for in love, not dollars. Husbandry of somebody else's land is a contradiction in terms. Husbandry is the heart of conservation.

"The second thing to grasp is that when we lay conservation in the lap of the government, it will always do the things it can, even though they are not the things that most need doing.

"The present over-emphasis on game farms, fish hatcheries, nurseries and artificial reforestation, importation of exotic species, predator control, and rodent control is here in point. These are things government can do. Each has an alternative, more or less developed, along naturalistic lines, *i.e.*, management or guidance of natural processes. Research shows these alternatives to be, in general, superior. But they involve husbandry, which government can do only on its own lands. Government lands are a minor fraction of our land area. Therefore government neglects the superior things that need doing, and does the inferior things that it can do. It then imputes to these things an importance and an efficacy they do not merit, thus distorting the growth of public intelligence.

"This whole twisted confusion stems from the painless path, from milk-and-water education, from prolonging our reliance on vicarious conservation." (p. 262.)

From "Wildlife in American Culture" (*Jour. Wildlife Manag.* 7, 1943:1–6):

"Ornithology, mammalogy, and botany, as now known to most amateurs, are but kindergarten games compared with researches in these fields. The real game is decoding the messages written on the face of the land. By learning how some small part of the biota ticks, we can guess how the whole mechanism ticks.

"Few people can become enthusiastic about research as a sport because the whole structure of biological education is aimed to perpetuate the professional research monopoly. To the amateur is allotted only make-believe voyages of discovery, the chance to verify what professional authority already knows. This is false; the case of Margaret Nice proves what a really enterprising amateur can do. What the youth needs to be told is that a ship is a-building in his own mental dry-dock, a ship with freedom of the seas. If you are a pessimist, you can say that this ship is 'on order'; if an optimist you can see the keel." (p. 5.)—F. N. H.

Winter Feeding

"Few pleasures are more fascinating than watching birds feeding at window-shelves and at stations near our houses . . . But let us be sincere with ourselves and not count this feeding as a virtue nor take credit for our generosity. The statement of the National Audubon Society that 'wildlife is at the weather's mercy during periods of subnormal winter temperatures and snow' is without foundation in fact. The birds do very well without us. Nature has taught them how and

where and in what latitude they can best feed themselves. The greatest consideration we can show to birds is to protect their natural environment. When this is impossible, the best feeding of birds is done by natural plantings. What birds need most is *protection from interference.*

"The bird feasts that we spread often set up false conditions . . . We learn little of the balance of nature when we observe it through a pane of glass. . . . . .

"But if you have already taught birds to abandon their wild ways be sure to continue to feed them until the coming of spring. In the event of an ice storm which covers ground and bark and standing seeds with a hard coating of ice, grain and other food scattered widely over the countryside may save many birds—particularly if an unseasonable ice storm should come in the spring after the migrating birds have arrived from the south." (Rosalie Edge, "Conservation for Victory," *Emerg. Cons. Com., Ann. Rep.,* 1942, Publ. 88, April, 1943:26.)

Mrs. Edge's example of the ice storm would seem to come very close to the Audubon Society's account of the effects of "subnormal" weather, and in any case couples poorly with the flat statements of her opening paragraph. Nevertheless, if she may here—as elsewhere—be criticized for driving a generality too far, she has a factual starting point which she has not hesitated to bring forward, even though the facts may be displeasing to many of her readers. The necessity for winter feeding of songbirds has been increasingly questioned of late. There can be little doubt that artificial winter feeding is being greatly over-emphasized as a conservation measure. In short, it is well to examine critically the idea of winter feeding, but it is too soon to consider the question settled. Meanwhile, remember Mrs. Edge's good advice: when you do start to put out feed next winter, don't stop until spring.—F. N. H.

Small Arms Ammunition for Civilian Use Rationed in Canada

Because of a two-thirds reduction, as compared with 1942, in the amount of necessary metal available for the manufacture of small arms ammunition for civilian use, the Wartime Prices and Trade Board of Canada has issued an Order, effective on March 24, 1943, which sets up rationing regulations to ensure that the reduced supply of such ammunition goes to essential users.

A spokesman for the Board pointed out that the supply of copper alloys is limited and that since such materials are required for both munitions for war purposes and ammunition for civilian use, curtailment of output of ammunition of the latter type is now necessary to safeguard the flow of materials for direct war use.

The Order divides Canada into remote areas and settled areas, as defined therein, and names eight classes of non-military "essential users" of small arms ammunition, including police; guards of commercial establishments; licensed trappers; prospectors; persons who rely on the hunting of wild game and birds for food; persons who require ammunition as a means of protecting live stock, poultry, and crops; gun clubs with special written permission to obtain ammunition; and certain defense units not organized under the Militia Act but furnished with written permission to obtain ammunition. Essential users resident in remote areas may purchase necessary ammunition without special formality, but those resident in settled areas may purchase ammunition only upon their completing and filing certificates of essentiality and, in some cases, obtaining the approval of their local ration board. Purchases of ammunition for the Dominion Government or for the government of any province are not affected by the order. Persons who desire to hunt for sport or for a non-essential food supply may not purchase ammunition for those purposes, but may use any ammunition that they may have had in their possession when the order became effective.—Harrison F. Lewis.

WILDLIFE CONSERVATION COMMITTEE
Frederick N. Hamerstrom, Jr., Chairman

ORNITHOLOGICAL LITERATURE[1]

SYSTEMATICS AND THE ORIGIN OF SPECIES, FROM THE VIEWPOINT OF A ZOOLOGIST. By Ernst Mayr. Columbia University Press, New York, 1942: 9 x 6 inches, xiv + 334 pp.; 29 figs. $4.00.

This outstanding book is based on the Jesup lectures delivered at Columbia University in March, 1941, and commences with an introduction by Dobzhansky, a geneticist noted for his interest in speciation and geographical variation.

The avowed purpose of the book is to outline the change from the old "static" species concept to the "dynamic" species concept of the modern systematist. The great significance of the polytypic species and the role of geographic variation in evolution are not properly appreciated by biologists or even by taxonomists, and Mayr undertakes to expound their importance and, by inference, their fascination.

The first two chapters are an excellent exposition of elementary taxonomic procedure. The next two are an equally interesting treatment of the phenomena and aspects of geographical variation. The fifth is perhaps the most controversial, since it deals with the "new," "dynamic" or "biological" species concept. This leads naturally to a discussion of the polytypic species, the helpful concept of the superspecies, and the important distinctions between allopatric and sympatric species (excellent terms, criticizable only on the grounds of etymological hybridity). The proof of geographic speciation is excellent, and the value of the superspecies concept in this connection is fully brought out. The systematist must remember that geographic speciation has been constantly denied.

Two summary definitions are worth quoting. In Mayr's view "species are groups of actually or potentially interbreeding natural populations, which are *reproductively isolated* from other such groups." "A new species develops if a population which has become geographically isolated from its parental species acquires during this period of isolation characters which promote or guarantee reproductive isolation when the external barriers break down." I hope that these definitions will arouse the interest and curiosity of readers, who will then read the book to discover their validity.

A chapter on non-geographic speciation is quite brief, since this is still a very controversial field. The ecological race, the sibling species, and the biological race are concepts which should particularly interest American ornithologists, for they define a field which is still "wide-open" with many common North American birds. They should read Mayr's discussion of the malarial mosquitos of southern Europe, where most of the species and races cannot be told apart as museum specimens!

Every chapter is replete with a wealth of illustration. Most of the cases are ornithological, and the author naturally prefers examples from Melanesia and Polynesia, on whose birds he is the world's authority. But he does not hesitate to give case histories in other groups of animals, and displays a breadth of knowledge of animals, genetics, and the literature of systematics which arouses admiration and respect, especially when we recall that he is not writing in his native language. There is more tolerance, less over-positive statement, than in his earlier writings. On a few occasions he boldly criticizes monographic studies in groups of animals other than birds, and revises the authors' conclusions to suit his own ideas; he has already been challenged at least twice.

The final chapter discusses the higher categories of classification, and is a sane and practical approach to the concepts of genus and family. Here and there are very courteous references to the A. O. U. check-list as "rather conservative," and suggestions as to the unnecessary number of genera and species, with most of which the reviewer is in hearty accord.

Mayr's book is the most comprehensive treatment in English of the new science

[1] For additional reviews see pages 87 and 125.

of speciation. Interestingly and clearly written, it arouses thought and reflection, and one returns to reread an earlier chapter. This review, at least, has not been dashed off. The reviewer is definitely a disciple of the new species concept; he is a systematist who has believed for years in the importance of the polytypic species and the role of geographic variation in the evolution of new species; he has deplored the lack of understanding in geneticists and experimental biologists.

What will this able book accomplish? First and foremost, it should help systematists to be better systematists, to abandon purely mind-made systems of putting animals into a series of cubbyholes of different sizes. The general biologist should be impressed with the weight of evidence which a competent expert like Mayr can martial for the importance of geographic variation. Some may complain that their pet group of animals has been neglected. Others will feel that experimental research has been slighted; it happens to be particularly difficult or impossible with birds. Others again may say that they still do not know how new species are evolved; our author does not claim to settle it. There is one difficulty inherent in systematics, as Mayr, I feel sure would be the first to admit. Systematics is a subjective field in two respects: (1) No written words and charts can take the place of knowledge in the field of the birds themselves or of the study of museum series. (2) On Mayr's own definition of a species, the impossibility of proof by experiment reduces the test of reproductive isolation to a question of individual judgment and authority rather than of fact. If systematists would only accept and face these two handicaps, their work would receive more consideration from other biologists and inspire more respect and less irritation from amateurs.—LUDLOW GRISCOM.

WILDLIFE REFUGES. By Ira N. Gabrielson. MacMillan, New York, 1943: 6 x 9¼ in., xiii + 257 pp., 32 pls., 17 figs. $4.00.

Wildlife conservation has come a long way since the time when restrictions on the kill were considered the complete solution. As a part of this development, the function of refuges has changed from that of saving individuals to one as much concerned with saving and managing habitats so that more individuals can be produced and supported by the land. A number of attendant values, as well as an appreciation of the limitations, of refuges have also come to be better understood. Examples of the former are contributions to flood- and erosion-control and supplying seasonal work and recreation to the people living nearby; of the latter, competition between different species on the same refuge, and destruction of habitats if refuges are allowed to become over-crowded. Methods of developing and handling refuges have also been more thoroughly worked out.

The first fifth of "Wildlife Refuges" expands these ideas under the headings: history, purposes, values and limitations, types, and management of refuges; about three-fifths deals with the refuges administered by the Fish and Wildlife Service; other federal, state, and private refuges in this country, Canadian and Mexican refuges, a bibliography, and an index make up the rest of the book. Although waterfowl are stressed, there is much that pertains to big game, upland game birds, non-game birds, and fur-bearers.

As Director of the Fish and Wildlife Service, Gabrielson has an unusually detailed knowledge of the whole refuge movement. This, coupled with his ability as a biologist, gives his judgments an authority which few others could claim. His examples of land treatments, and of the solution of disagreements between cooperating agencies, give one a better understanding of the actual mechanics of refuge development, and serve as the best sort of precepts.

Gabrielson's enthusiasm for the necessity and effectiveness of the work of his Service has caused that work to be better and sooner done; if carried over too extensively into his writing, however, this spirit may hinder his readers in appraising the results of the refuge program. There is some evidence that this may have

occurred. To cite the most obvious example: in speaking of the development of the nine-foot channel through the Upper Mississippi Refuge, he says (italics mine), ". . . after consultation with the Service, the Army Engineers so modified construction plans that the area, far from being destroyed, *has been* vastly improved." (p. 193) The examples which are to substantiate this accomplished improvement read: The first pool *"is becoming* a fine waterfowl resort . . ."; in the later pools *"indications* of the same development are seen. Only a few of the pools *are yet* sufficiently vegetated to be attractive . . . The wildlife value of the Upper Mississippi Refuge is now entirely dependent on the operation of the dams. *If* they are so managed as to minimize water fluctuations and to limit winter drainage of the pools, this area *will become* a major wildlife habitat of the midcontinent." (p. 193) There are less important faults, such as the placing of maps and illustrations, without page references, far from the descriptive texts. In places the writing shows evidences of haste.

These flaws should not blind one to the value of the book. "Wildlife Refuges" will be interesting to the layman and a useful reference work for the professional conservationist. There is no other single book on the subject, and this one, if not up to Gabrielson's best, is still a good job.—F. N. Hamerstrom, Jr.

BIBLIOGRAPHY

PHYSIOLOGY (*including weights*)

AMADON, DEAN. Bird Weights and Egg Weights. *Auk,* 60, No. 2, April, 1943: 221–234.

BARTSCH, PAUL. Birds and smell. *Auk,* 60, No. 2, April, 1943:271–272.

BEHLE, WILLIAM H. Weights of Some Western Subspecies of Horned Larks. *Auk,* 60, No. 2, April, 1943: 216–221.

EDWARDS, ERNEST P. Hearing Ranges of Four Species of Birds. *Auk,* 60, No. 2, April, 1943: 239–241.

LAMOREUX, W. F. The Influence of Different Amounts of Illumination upon the Body Weight of Birds. *Ecol.,* 24, No. 1, Jan., 1943: 79–84.

MONTAGNA, WILLIAM. Weights and Plumages of the Horned Larks of Central New York. *Auk,* 60, No. 2, April, 1943: 210–215.

ANATOMY (*including plumage and molt*)

FISHER, HARVEY I. The Pterylosis of the King Vulture. *Condor,* 45, No. 2, Mar., 1943: 69–73, figs. 21–24.

GLENNY, FRED H. A Systematic Study of the Main Arteries in the Region of the Heart, Aves VI. Trogoniformes, Part 1. *Auk,* 60, No. 2, April, 1943: 235–239.

HOCHBAUM, H. ALBERT. Sex and Age Determination of Waterfowl by Cloacal Examination. *Trans. 7th N. Amer. Wildlife Conf.,* 1942: 299–307, fig. 1.

PETRIDES, GEORGE A. Variation in the outermost greater primary covert as related to method of flight. *Auk,* 60, No. 2, April, 1943: 264–265.

PETRIDES, GEORGE A. Age Determination in American Gallinaceous Game Birds. *Trans. 7th N. Amer. Wildlife Conf.,* 1942: 308–328, figs. 1–4.

UTTAL, LEONARD J. Two oddly-plumaged Ruffed Grouse. *Auk,* 60, No. 2, April, 1943: 266–267, pl. 7.

WOOLFOLK, E. J. A White Meadowlark in Eastern Montana. *Condor,* 45, No. 2, Mar., 1943: 75.

WRIGHT, PHILIP L. and ROBERT W. HIATT. Outer primaries as age determiners in gallinaceous birds. *Auk,* 60, No. 2, April, 1943: 265–266, pl. 7.

See also *Physiology:* Montagna.

DISTRIBUTION AND TAXONOMY

BALL, STANLEY C. Further Bird Notes from Gaspé, Quebec. *Canad. Field-Nat.,* 57, No. 1, Jan., 1943: 1–4.

BEE, ROBERT G. and JOHN HUTCHINGS. Breeding Records of Utah Birds. *Great Basin Nat.*, 3, Nos. 3 and 4, Dec., 1942 [1943]: 61–85.

BRODKORB, PIERCE. Notes on two rare birds in Chiapas, Mexico. *Auk*, 60, No. 2, Apr., 1943: 280–282. (*Xenotriccus* and *Spodiornis*).

DIXON, JOSEPH S. Birds Observed between Point Barrow and Herschel Island on the Arctic Coast of Alaska. *Condor*, 45, No. 2, Mar., 1943: 49–57, figs. 13–18.

GOODWILL, E. V. The Summer Birds of the Medsen Area, Patricia District, Ontario. *Canad. Field-Nat.*, 56, Nos. 8 and 9, Nov.–Dec., 1942 [1943]: 131–133.

GRATER, RUSSELL K. Bird Notes from Southwestern Utah. *Condor*, 45, No. 2, Mar., 1943: 75–76.

HAYWARD, C. LYNN. Notes on the status of the Red Crossbill in Utah. *Auk*, 60, No. 2, Apr., 1943: 276–278.

JEWETT, STANLEY G. A New Horned Lark from the State of Washington. *Auk*, 60, No. 2, April, 1943: 262–263. (*Otocoris alpestris alpina*, new subsp.).

MACKWORTH-PRAED, C. W. Nature and Nomenclature. *Ibis*, 85, Apr., 1943: 223–224.

MAYR, ERNST. The Zoogeographic Position of the Hawaiian Islands. *Condor*, 45, No. 2, Mar., 1943: 45–48.

NORTON, ARTHUR H. European Teal in Maine. *Auk*, 60, No. 2, Apr., 1943: 283–284.

PETERS, JAMES L. First Supplement to the List of Types of Birds Now in the Museum of Comparative Zoology. *Bull. Mus. Comp. Zool.*, 92, No. 2, Mar., 1943: 53–104.

PETTINGILL, OLIN SEWALL, JR. Birds' Eggs Collected by George Griffin at Grand Manan, New Brunswick. *Canad. Field-Nat.*, 57, No. 1, Jan., 1943: 13.

PHILLIPS, ALLAN R. Critical Notes on Two Southwestern Sparrows. *Auk*, 60, No. 2, April, 1943: 242–248. (New forms: *Aimophila botterii texana* from Texas; *A. b. goldmani* from Nayarit; *Melospiza melodia bendirei* from Arizona).

RAND, A. L. Larus kumlieni and Its Allies. *Canad. Field-Nat.*, 56, Nos. 8 and 9, Nov.–Dec., 1942 [1943]: 123–126, map. (A revision of the Glaucous, Iceland, and Herring Gull complex of North America).

ROBBINS, SAMUEL D., JR. A Review of Wisconsin's Bird-life in 1942. *Passenger Pigeon*, 5, No. 1, Apr., 1943: 1–5, photo.

SHORTT, T. M. Correlation of Bill and Foot Coloring with Age and Season in the Black Duck. *Wils. Bull.*, 55, No. 1, Mar., 1943: 3–7, pl. 1.

SHORTT, T. M. and H. S. PETERS. Some Recent Bird Records from Canada's Eastern Arctic. *Canad. Jour. Res.*, 20, Nov., 1942: 338–348, map.

SNYDER, L. L. Summer Birds of the Sault Ste. Marie Region, Ontario. *Trans. Roy. Can. Inst.*, 24, part 1, 1942: 121–153.

TODD, W. E. CLYDE. List of the Hummingbirds in the Collection of the Carnegie Museum. *Annals Carnegie Mus.*, 29, Art. 12, 1942: 271–370.

TODD, W. E. CLYDE. Critical Remarks on the Trogons. *Proc. Biol. Soc. Wash.*, 56, Feb., 1943: 3–16.

VAN TYNE, JOSSELYN. A peculiar Goshawk from Labrador. *Auk*, 60, No. 2, April, 1943: 267–268. (Apparently *Accipiter g. gentilis*).

WEBSTER, J. DAN. The Downy Young of Oyster-catchers. *Wils. Bull.*, 55, No. 1, Mar., 1943: 40–46.

WETMORE, ALEXANDER. Evidence for the Former Occurrence of the Ivory-billed Woodpecker in Ohio. *Wils. Bull.*, 55, No. 1, Mar., 1943: 55.

ZIMMER, JOHN T. and ERNST MAYR. New Species of Birds Described from 1938 to 1941. *Auk*, 60, No. 2, April, 1943: 249–262.

EVOLUTION AND SPECIATION

AMADON, DEAN. Specialization and Evolution. *Amer. Nat.*, 77, Mar., 1943: 133–141.

POPULATION

ALLAN, PHILIP F. and PALMER R. SIME. A Hawk Census on Texas Panhandle Highways. *Wils. Bull.*, **55**, No. 1, Mar., 1943: 29–39, 2 figs.

HIATT, ROBERT W. A Frequency Distribution of Eastern and Western Kingbirds in Montana. *Great Basin Nat.*, **3**, Nos. 3 and 4, Dec., 1942 [1943]: 109–114, pl. 1 (*Tyrannus tyrannus* and *T. verticalis*).

KENYON, KARL W. Birds Found Dead on the Beach in San Diego County, California. *Condor*, **45**, No. 2, Mar., 1943: 76–77.

LACK, DAVID. The Age of Some More British Birds. *Brit. Birds*, **36**, No. 10, Mar., 1943: 193–197.

LACK, DAVID. The Age of the Blackbird. *Brit. Birds*, **36**, No. 9, Feb., 1943: 166–175. (*Turdus merula*).

LASKEY, AMELIA R. Some Age Records for Banded Birds. *Migrant*, **14**, No. 1, Mar., 1943: 5–8.

MOFFITT, JAMES. Twelfth Annual Black Brant Census in California. *Calif. Fish and Game*, **29**, No. 1, Jan., 1943: 19–28.

See also *Techniques:* Allen.

MIGRATION

SNYDER, L. L. The Snowy Owl Migration of 1941–42. *Wils. Bull.*, **55**, No. 1, Mar., 1943: 8–10, 1 fig.

WILLIAMS, C. S. and E. R. KALMBACH. Migration and Fate of Transported Waterfowl. *Jour. Wildlife Manag.*, **7**, No. 2, April, 1943: 163–169.

See also *Population:* Allan and Sime; *Life History and Behavior:* Ludwig.

ECOLOGY

FRIEDMANN, HERBERT. The Natural History Background of Camouflage. *Smithsonian Inst. War Background Studies No.* **5**, 1942: 1–17, pls. 1–16.

JOHNSTON, VERNA R. An Ecological Study of Nesting Birds in the Vicinity of Boulder, Colorado. *Condor*, **45**, No. 2, Mar., 1943: 61–68.

MUNRO, J. A. Competition between Mountain Bluebirds and Hairy Woodpeckers. *Condor*, **45**, No. 2, Mar., 1943: 74.

RICHARDSON, FRANK. Relations between Birds, Highways, and Snows in Nevada. *Condor*, **45**, No. 2, Mar., 1943: 77.

WALKINSHAW, LAWRENCE H. Snakes Destroying Birds' Eggs and Young. *Wils. Bull.*, **55**, No. 1, Mar., 1943: 56.

LIFE HISTORY AND BEHAVIOR

ALDOUS, SHALER E. Sharp-tailed Grouse in the Sand Dune Country of North-central North Dakota. *Jour. Wildlife Manag.*, **7**, No. 1, Jan., 1943: 23–31, pls. 1–2, fig. 1.

BALL, STANLEY C. Chimney Swifts at play. *Auk*, **60**, No. 2, April, 1943: 269–270.

BECK, D. ELDEN. Life History Notes on the California Gull. *Great Basin Nat.*, **3**, Nos. 3 and 4, Dec., 1942 [1943]: 91–108, pls. 1–4. (In Utah).

BULLOCK, D. S. Duck Hawk at sea. *Auk*, **60**, No. 2, Apr., 1943: 274.

CARR-LEWTY, R. A. Reactions of Birds to Aircraft. *Brit. Birds*, **36**, No. 8, Jan., 1943: 151–152.

DOW, JAY S. A Study of Nesting Canada Geese in Honey Lake Valley, California. *Calif. Fish and Game*, **29**, No. 1, Jan., 1943: 3–18, figs. 1–10.

EINARSEN, ARTHUR S. Specific Results from Ring-necked Pheasant Studies in the Pacific Northwest. *Trans. 7th N. Amer. Wildlife Conf.*, 1942: 130–146.

GILKEY, ARTHUR K., W. DAVID LOOMIS, BRUCE M. BRECKENRIDGE, and C. HOWARD RICHARDSON. The incubation period of the Great Horned Owl. *Auk*, **60**, No. 2, April, 1943: 272–273.

HARRELL, BYRON E. Minnesota Nesting Records, 1942. *Flicker*, **14**, No. 4, Dec., 1942: 33–40.

HERBERT, RICHARD and ROGER T. PETERSON. Duck Hawk eyries in southern states. *Auk*, **60**, No. 2, April, 1943: 274.

HOLLOM, P. A. D. Bank Swallows nesting in artificial holes. *Auk*, **60**, No. 2 April, 1943: 270–271.

HOLSCHER, CLARK E. Observations on the Montana Horned Owl. *Condor*, **45**, No. 2, Mar., 1943: 58–60, figs. 19–20.

HUTCHISON, SCOTT, ALFRED CLEBSCH, *et al.* How Birds Spend Their Winter Nights. *Migrant*, **14**, No. 1, Mar., 1943: 1–5.

LUDWIG, C. C. Mourning Doves. *Jack Pine Warbler*, **21**, No. 2, April, 1943: 56–57.

MICKEY, FRANCES WELTON. Breeding Habits of McCown's Longspur. *Auk*, **60**, No. 2, April, 1943: 181–209.

MORLEY, AVERIL. Sexual Behavior of British Birds from October to January. *Ibis*, **85**, April, 1943: 132–158.

NICKELL, WALTER P. Observations on the Nesting of the Killdeer. *Wils. Bull.*, **55**, No. 1, Mar., 1943: 23–28, 2 figs.

NICKELL, WALTER P. Secondary Uses of Birds' Nests. *Jack Pine Warbler*, **21**, No. 2, April, 1943: 48–54, figs. 1–3.

RAND, A. L. Some Irrelevant Behavior in Birds. *Auk*, **60**, No. 2, April, 1943: 168–171.

ROSS, WINIFRED M. How a Tree-creeper Built Its Nest. *Brit. Birds*, **36**, No. 6, Nov., 1942: 110–111. (*Certhia familiaris britannica*).

SPENCER, O. RUTH. Nesting Habits of the Black-billed Cuckoo. *Wils. Bull.*, **55**, No. 1, Mar., 1943: 11–22.

STEWART, ROBERT E. Post-breeding pugnacity of the Pine Warbler. *Auk*, **60**, No. 2, April, 1943: 271.

TERRILL, L. McI. Nesting Habits of the Yellow Rail in Gaspé County, Quebec. *Auk*, **60**, No. 2, April, 1943: 171–180, pls. 5, 6.

TUCKER, B. W. Aerial Evolutions and Soaring of Cormorants. *Brit. Birds*, **36**, No. 6, Nov., 1942: 114–115. (*Phalacrocorax carbo*).

WHITAKER, LOVIE M. Roosting Habits of the Verdin. *Wils. Bull.*, **55**, No. 1, Mar., 1943: 55–56.

See also *Physiology:* Bartsch; Edwards.

FOOD OF BIRDS

BEER, JAMES. Food Habits of the Blue Grouse. *Jour. Wildlife Manag.*, **7**, No. 1, Jan., 1943: 32–44, figs. 1–4.

BRYANT, HAROLD C. Birds Eat Snow. *Condor*, **45**, No. 2, Mar., 1943: 77.

HAMILTON, W. J., Jr. Spring food of the Robin in central New York. *Auk*, **60**, No. 2, April, 1943: 273.

HAWBECKER, ALBERT C. Sparrow Hawk Preys on Sanderling. *Condor*, **45**, No. 2, Mar., 1943: 74.

KITTAMS, WALTER H. October foods of Ruffed Grouse in Maine. *Jour. Wildlife Manag.*, **7**, No. 2, Apr., 1943: 231–233.

KNOWLTON, G. F. Raven eats Mormon cricket eggs. *Auk*, **60**, No. 2, April, 1943: 273.

See also *Techniques:* Gerstell.

TECHNIQUES (*including banding*)

ALLEN, D. L. A Pheasant Inventory Method Based upon Kill Records and Sex Ratios. *Trans. 7th N. Amer. Wildlife Conf.*, 1942: 329–333.

DAVISON, VERNE E. A Calendar System of Record Keeping for Sportsmen. *Jour. Wildlife Manag.*, **7**, No. 2, Apr., 1943: 129–133, fig. 1.

GERSTELL, RICHARD. The Place of Winter Feeding in Practical Wildlife Management, *Pennsylvania Game Comm., Research Bull. No.* 3, 1942 (121 pp.).

KELKER, GEORGE HILLS. A Winter Wildlife Census in Northern Wisconsin. *Jour. Wildlife Manag.*, 7, No. 2, Apr., 1943: 133–141, fig. 1.

OTA, ROBERT K. and HARRY BECKMAN. A Simple Bird Holder for Use in Avian Malaria Studies. *Science*, **97**, April 23, 1943: 384.

SOPER, J. DEWEY. A method of remaking old bird skins. *Auk*, 60, No. 2, Apr., 1943: 284–286.

VAN TYNE, JOSSELYN. Some Problems for Michigan Bird Students. *Jack Pine Warbler*, 21, No. 1, Jan., 1943: 3–6.

WOOD, A. A. Cold Storage as an Aid to the Busy Ornithologist. *Canad. Field-Nat.*, 56, Nos. 8 and 9, Nov.–Dec., 1942 [1943]: 137–138.

See also *Anatomy:* Hochbaum; Petrides; Wright.

HISTORY, BIOGRAPHY, BIBLIOGRAPHY, AND INSTITUTIONS

CHAPMAN, FRANK M. Birds and Man. *Amer. Mus. Nat. Hist. Guide Leaflet No.* 115, 1943. 52 pp., illus.

HAYWARD, C. LYNN. John Hutchings and Robert G. Bee—Pioneer Utah Valley Naturalists. *Great Basin Nat.*, 3, Nos. 3 and 4, Dec., 1942 [1943]: 86–90.

MCDERMOTT, JOHN F. Audubon's "Journey up the Mississippi." *Jour. Ill. State Hist. Soc.*, 35, No. 2, June, 1942: 148–173.

PORTER, MARGARET D. A Bibliography of the Published Writings of Outram Bangs. *Bull. Mus. Comp. Zool.*, 92, No. 2, Mar., 1943: 105–118.

STEVENS, O. A. Elmer T. Judd, North Dakota Ornithologist. *Wils. Bull.*, 55, No. 1, Mar., 1943: 51–53.

TAYLOR, MRS. H. J. An Iowa Ornithologist: T. C. Stephens. *Iowa Bird Life*, 13, No. 1, Mar., 1943: 2-6, 2 photos.

TYLER, WINSOR M. In Memoriam: Glover Morrill Allen. *Auk*, 60, No. 2, Apr., 1943: 163–168, pl. 4.

WITHERBY, H. F. Hubert Lynes: A Biographical Sketch. *Ibis*, 85, Apr., 1943: 198–215, pl. 5.

ZIMMER, JOHN T. Myron Harmon Swenk, 1883–1941. *Wils. Bull.*, 55, No. 1, Mar., 1943: 47–50.

PALEONTOLOGY

MILLER, LOYE. The Pleistocene Birds of San Josecito Cavern, Mexico. *Univ. Calif. Publ. Zool.*, 47, No. 5, 1943: 143–168.

MILLER, LOYE and IDA DEMAY. The Fossil Birds of California. An Avifauna and Bibliography with Annotations. *Univ. Calif. Publ. Zool.*, 47, No. 4, 1942: 47–142.

REPORT OF THE MEMBERSHIP COMMITTEE

During 1942, as a result of the combined efforts of the officers, the Membership Committee, and various members of the Club, 172 members were added to the Wilson Ornithological Club: 7 Life, 7 Sustaining, 26 Active, and 132 Associate Members.

Members of the Committee and others whose efforts added to the Wilson Club rolls during the year were Roger Tory Peterson, 14; George B. Thorp, 8; John T. Emlen, Jr., Joseph C. Howell, Thomas G. Scott, and Ruth D. Turner, 6 each; A. B. Brooks, 5; J. W. Aldrich, Virginia S. Eifert, Gordon Fredine, Z. P. Metcalf, William Montagna, Aretas A. Saunders, and Wayne Short, 4 each; Daniel L. Leedy and Burt L. Monroe, 3 each; James L. Baillie, David Damon, Mrs. Jack Hagar, H. W. Hann, A. Sidney Hyde, George H. Lowery, M. B. Skaggs, and Wendell Taber, 2 each; William C. Baker, Edna Becker, Logan Bennett, James H. Bruns, B. W. Cartwright, Roland C. Clement, Clifford V. Davis, Murl Deusing, John H. Fales, Franklin C. French, A. F. Ganier, F. N. Hamerstrom, Jr., Charles O. Handley, Jr., George B. Happ, Dorothy Hobson, William Jenner, Victor E. Jones, Herbert Kaufman, Karl Maslowski, Clara Alma Moore, Theodora Nelson, Eugene P. Odum, Frederick L. Ott, John Pearce, W. E. Scott, P. R. Sime, Mabel Slack, Charles F. Walker, and James B. Young, one each.

The following officers also assisted in adding new members during 1942: Maurice Brooks, Olin Sewall Pettingill, Jr., George Miksch Sutton, Gustav Swanson, and Josselyn Van Tyne.

Respectfully submitted,

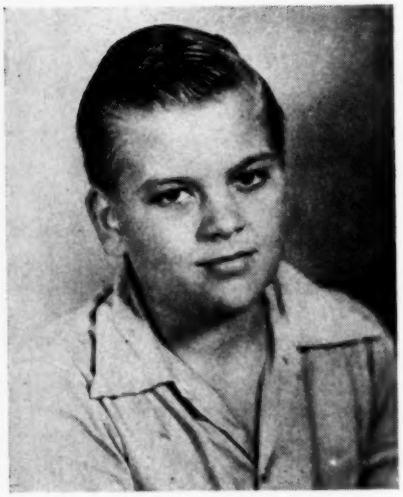
December 31, 1942 RICHARD LEE WEAVER, *Chairman*

MEMBERSHIP COMMITTEE, 1943:

Arizona	Alan R. Phillips
California	John T. Emlen
	Frank A. Pitelka
Colorado	Gordon Alexander
Connecticut	Aretas A. Saunders
Georgia	Eugene P. Odum
Illinois	Virginia S. Eifert
	S. Charles Kendeigh
	R. M. Strong
Indiana	Dorothy Hobson
Iowa	Geo. O. Hendrickson
	George B. Thorp
Kentucky	Gordon Wilson
Maine	Howard L. Mendall
Maryland	Philip F. Allan
Massachusetts	Bartlett Hendricks
	John Pearce
Michigan	H. W. Hann
	L. H. Walkinshaw
	George J. Wallace
Minnesota	Arnold B. Erickson
	O. S. Pettingill, Jr.
Missouri	Paul D. Dalke
Nebraska	R. Allyn Moser
New Hampshire	Louise Forsythe
	Douglas E. Wade
New Mexico	Alton A. Lindsey
New York	Lawrence I. Grinnell
	Harold D. Mitchell
	Dayton Stoner
	Ruth D. Turner
North Carolina	Z. P. Metcalf
North Dakota	Stanley Saugstad
Ohio	Lawrence E. Hicks
	Milton B. Trautman
Pennsylvania	Logan J. Bennett
	Edwin T. Moul
South Carolina	Harold S. Peters
South Dakota	Gerald Spawn
Utah	William H. Behle
	Ross Hardy
Vermont	Wendell P. Smith
Virginia	C. O. Handley, Jr.
Washington, D.C.	John W. Aldrich
West Virginia	Maurice Brooks
Wisconsin	Murl Deusing
	Walter E. Scott
Wyoming	Otto M. McCreary
Canada	James L. Baillie, Jr.
	Doris Huestis Speirs

RICHARD LEE WEAVER, *Chairman*

NEW LIFE MEMBER



EDWARD MC ILHENNY SIMMONS, now attending Newman High School in New Orleans, has studied natural history all his life under the direction of his grandfather, Edward Avery Mc Ilhenny. He has a considerable library covering ornithology, mammalogy, and general natural history subjects, and is an Annual Member of the American Museum of Natural History and of the National Audubon Society, a Life Member of the American Ornithologists' Union, and the American Society of Mammalogists. Home address—Avery Island, Louisiana.

WILSON ORNITHOLOGICAL CLUB LIBRARY

The following gifts have been received recently:

Emmet R. Blake: 1 pamphlet
William B. Evans: 1 book
Horace Groskin: 1 reprint
George O. Hendrickson: 26 reprints
Frank J. Hinds: 2 magazines, 6 reprints
S. Charles Kendeigh: 2 reprints
Robert B. Lea: 1 reprint
V. E. Shelford: 1 reprint
O. A. Stevens: 1 pamphlet
Herbert L. Stoddard: 8 reprints
Dayton Stoner: 4 reprints, 1 pamphlet
G. C. Toner: 4 magazines
Richard L. Weaver: 2 reprints
Gordon Woods: 4 reprints

TO OUR CONTRIBUTORS

Our members are asked to submit articles for publication in the *Bulletin*. Manuscripts will be accepted with the understanding that they have not been published or accepted for publication elsewhere.

MANUSCRIPT. Manuscripts should be typed on paper of good quality and of letter size (8½ x 11). Write on one side only and use double spacing. The title should be brief and carefully constructed so as to indicate clearly the subject. Ordinarily the scientific names of the birds treated should be given and should appear early in the article. Most articles should have a brief summary at the end.

ILLUSTRATIONS. Photographic prints, to reproduce well as half-tones, should have good contrast and detail. Please send prints unmounted, and attach to each print a brief but adequate legend. Do not write heavily on the backs of photographs.

BIBLIOGRAPHY. Literature cited should ordinarily be listed at the end of articles. These citations should be complete and references to them in the text should be made by the year of the citation and the exact pages referred to.

PROOF. Galley proof will be submitted to authors and must be returned promptly. Expensive alterations in copy after the type has been set must be charged to the author.

REPRINTS. The Club is unable to furnish free reprints to authors. Arrangements will be made, however, for reprints to be made at cost. A scale of costs, based on the number of pages, is given below. Orders for reprints should accompany the returned galley proof. Charge will be made for a minimum of 100 reprints.

REPRINT SCHEDULE OF THE WILSON BULLETIN

	1 page	2 pp.	4 pp.	8 pp.	12 pp.	16 pp.	Each Additional 4 pp.
100 copies	$1.95	$2.10	$2.40	$4.15	$5.90	$7.00	85c
Each Additional 100 copies	70c	85c	1.40	2.20	2.90	3.50	55c

Covers: $3.85 for first 100 copies; $1.40 for additional 100 copies.